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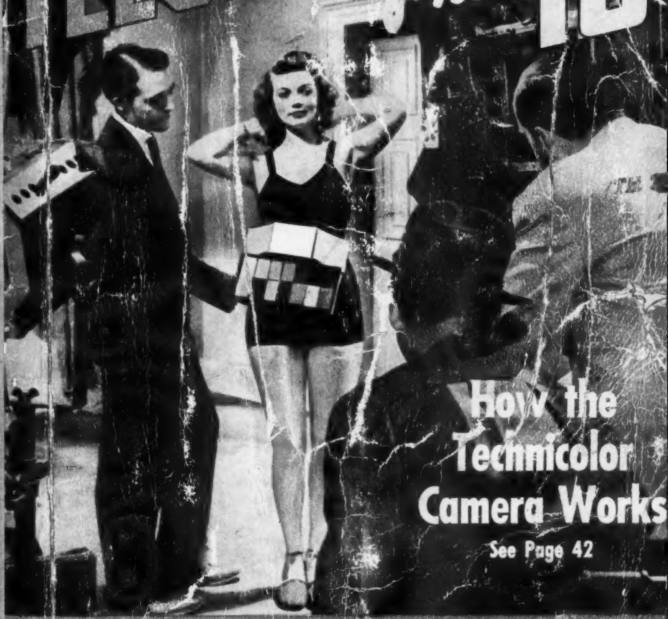

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AIR RAID!

London, Paris, Berlin, Rome, New York, Tokio, Moscow—these are the nerve centers of the world! These are the proud cities of today destined to be mere heaps of smoldering ruins when monster bombers raid them tomorrow. Is there a defense against flying fortresses and long-range bombers? Can foreign war planes really penetrate military defenses and devastate populous areas?

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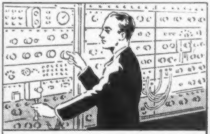

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INVENTORS

THIS is the time of year when ambitious, forward-thinking men *look ahead,* lay plans for the future that may mature into profitable reality. Last year the record-playing attachment for radios became a reality and sold like "hot cakes" at a low popular price. Women's clothes were almost revolutionized by the introduction of the "house coat." The "electric nurse"—a guard against kidnappers—hit the market with a bang. Portable air-conditioners went up in value, down in price. The gearless hydraulic transmission has become a practicality. Farmers saved thousands of dollars with electric fencing.

Every year brings new inventions. There will be more in 1939. Smart men will plant the seeds of invention into the fields of industry, and reap the harvest when it is ripe. So do your spring "idea planting" *early.*

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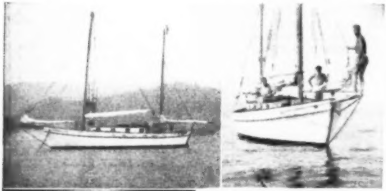

First class craftsmanship is evident in this "Tahiti" boat which Harold Oakes constructed from MI plans. The cabin (left) sleeps two comfortably, four on a short trip. "Tahiti" is 30 feet long with a 9-foot beam and moderate draft. More than 40 have been built by MI reader-craftsmen and Oakes seeks to correspond with them regarding the idea of interesting five or more owner-builders in entering a race to Honolulu, which is being sponsored by the management of the Golden Gate International Exhibition. See text for further information

AN UNUSUAL letter and some excellent project photos won this month's Workbench award of $5 for Harold Oakes, of Portland, Oregon. The photos show the "Tahiti" boat he constructed from MI plans and I'm sure that every workshop fan will agree that the exterior and interior views of the craft indicate that Harold's craftsmanship merits a rating of "first class."

"Tahiti" has been praised by many boating authorities as being one of the best sea-going cruisers ever designed and Harold proved the seaworthiness of his 30-foot craft by sailing it along the Oregon coast for six weeks during his last vacation. So well did the boat perform that he now intends to enter it in a race to Honolulu, which is being sponsored by the management of the Golden Gate International Exposition. However, before the sponsors of the race will agree to creating a special "Tahiti" class, it will be necessary for at least five of them to be entered. If you have a "Tahiti" and would like to enter the proposed race, write to Harold at 3115 S.E. 24th Ave., for complete details about rules, prizes, etc. The entire MI staff wishes you good luck, Oakes.

***

Scoring a $3 prize, a photo sent in by Nick Vlahakes, of Birmingham, Ala., shows the gas-powered model airplane he constructed. The model is a G.H.Q. Sportster and is powered by a G.H.Q. miniature gasoline engine. The wingspan is 6 feet, 4 inches and the total weight, ready to fly, is about 4½ pounds. Nick spent about 125 hours building the model, but his painstaking care has been rewarded with some excellent, graceful flights. Good work, Nick. Keep up your interest in the flying "putt-putt" and someday you'll be piloting a real plane over your neighborhood homes.

***

Speaking of gas-powered model planes, I want to go on record as stating that flying this type of model is the next best thrill to piloting a real airplane that any air-minded boy or young man can enjoy. Being both a gas-model "flier" and a licensed airplane pilot, I speak from experience. Try your hand at this fascinating and instructive hobby, which is attracting more fans each day.

***

Another winner of a $3 award is Harold Sandquist, of Jamestown, N. Y., whose project photo shows the midget car he constructed. The car was built from parts salvaged from old autos of various types, acetylene and arc welding equipment being the principal tools used. The wheelbase is 82 inches and the tread 44 inches. Power is sup-

[*Continued on page* 14]

Powered by a G.H.Q. miniature gasoline motor, this model airplane has made some excellent flights, according to builder Nick Vlahakes. Wingspan is 6 feet, 4 inches. Weight, 4½ lbs.

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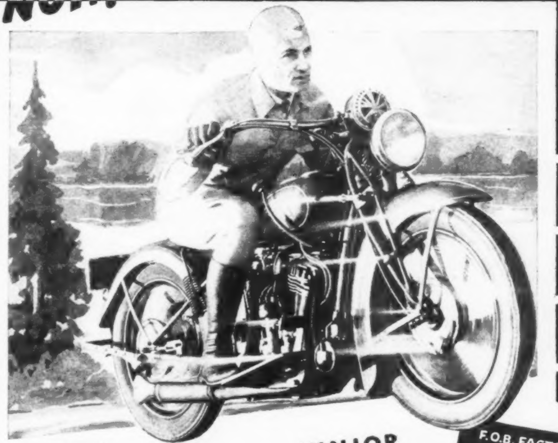

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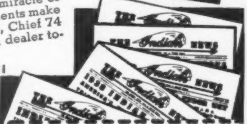

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Editor's Workbench Chips

[*Continued from page* 12]

Harold Sandquist built this "nifty" looking auto from parts salvaged from larger cars. It can speed along at 80 m.p.h.

plied by a Model A Ford engine and a speed of 80 m.p.h. is claimed. Sure is a "nifty" job, Harold.

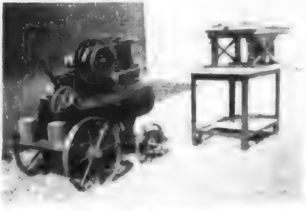
* * *

A novel project is that shown in the photo sent in by George A. Kallenbach, of Evansville, Ind., who was awarded a $3 prize. George's project is a model traction engine which he uses to run a rip saw. It is powered by a one-half horsepower gasoline motor mounted on a 10x30-inch water tank. When geared to a six-inch rip saw by means of a belt, it enables the saw to cut one-inch lumber without trouble. To further carry out the appearance of a traction engine, the model is equipped with a governor, headlight, steering gear and lever. My compliments accompany the check MI has mailed to you, George.

* * *

If you live on a farm you are certain to be interested in the tractor built by Austin York, of Carlton, Oregon, whose project photo scored a $3 prize. A feature of the home-built tractor is that the rear wheels are equipped with individual brakes, facilitating shorter turning on soft ground.

[*Continued on page* 16]



Built by George Kallenbach, this model steam traction engine is actually powered by a small gasoline motor and is used to run a rip saw which easily cuts lumber one-inch in thickness.

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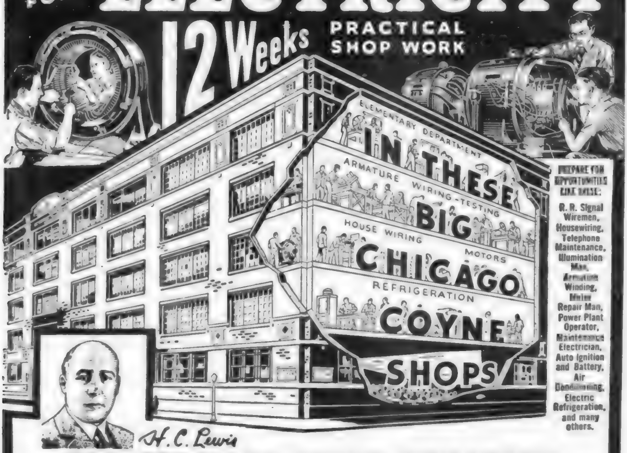

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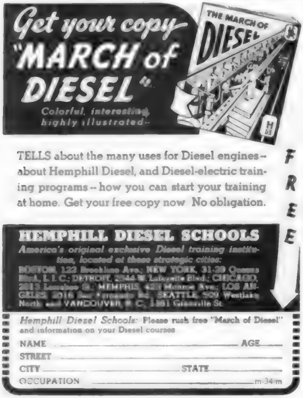
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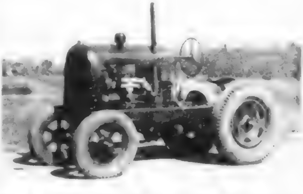
Editor's Workbench Chips

[*Continued from page* 14]

The frame is built up of parts salvaged from old autos and trucks. Power is supplied by a Star four-cylinder motor. Wheelbase is 67 inches and tread 39 inches. It's a sturdy looking job, Austin.



Ready to simplify many jobs around a farm, this tractor was built by Austin York. Rear wheels feature individual brakes, facilitating shorter turning when traveling over soft ground.

From Freeport, L. I., photo-fan Edward Ziegler sent in a photo showing the "Autoset" enlarger he constructed from plans that appeared in the November (1938) issue of MI. Using an available camera lens, he built the enlarger at a total cost of only $1.10! Results, he claims, equal those obtained with professionally-made enlargers. Well done, Ed. Watch for the mailman bearing an MI check for $3.

* * *

Regardless of the season, photographs of midget racing cars constructed by MI reader-craftsmen continue to arrive at my desk in increasing numbers. One of the best photos received recently shows the midget racer built by Ben Hollis, Jr., of Wilmington, N. C. The chassis is made of channel iron with all seams electrically welded, a motorcycle engine being mounted crosswise between

[*Continued on page* 18]

Edward Ziegler built this photo enlarger at a total cost of only $1.10.

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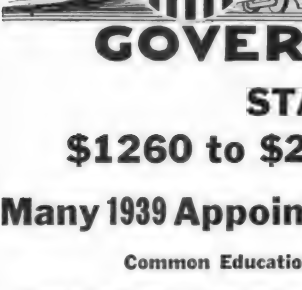

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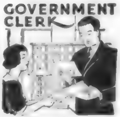

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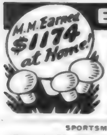

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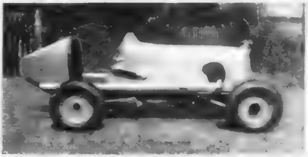
Editor's Workbench Chips

[*Continued from page 16*]



A top speed of almost 100 m.p.h. is claimed for this home built midget racer by Ben Hollis, Jr. It features a three-speed transmission and is powered by an old motorcycle engine.

the chassis frames. Hooked up with a three-speed transmission and differential, the motor enables the car to attain a speed of almost 100 m.p.h. The wheelbase is 60 inches and the tread is 39 inches. I'd sure like to "pilot" your racer for a trial run, Ben. An MI check for $3 is in the mail.

* * *

Another photography fan who scored a $3 prize is Norb Gumbel, of Waukegan, Ill., who is shown adjusting the enlarger he constructed from plans that appeared in the March (1938) issue of MI. Norb made a few minor changes in the enlarger in order to make use of available materials. A real photo fan, he has constructed most of his equipment from plans that have appeared in MI or its sister publications "Good Photography" and "Photography Handbook." Like other photography "bugs," Norb wants to see more articles on his favorite subject appear in MI. Watch our future issues, Norb. We won't disappoint you.

Norb Gumbel is shown adjusting the enlarger he constructed from MI plans.

* * *

Something different from the usual run of model projects is shown in the photo sent in by George Voigt, of Wilmington, Ill. It is an exact replica of a five-cylinder 500 horsepower diesel engine. Built on a scale of one inch to the foot, the model was built from parts of old clocks and parts turned out on a lathe. A concealed electric motor in the model's base operates it, providing the ap-

[*Continued on page 20*]

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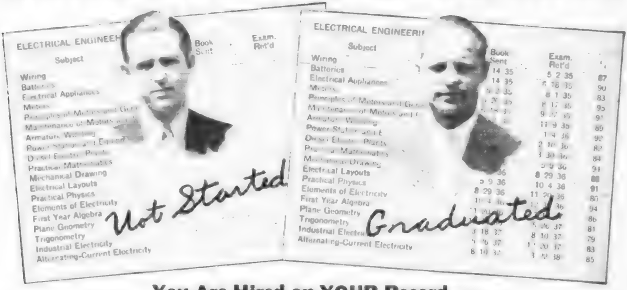

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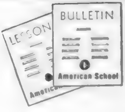

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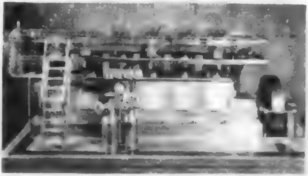
Editor's Workbench Chips

[*Continued from page* 18]



A novel project is this replica of a 500 horsepower diesel engine. Constructed by George Voight, its base houses a small electric motor which provides realistic operation.

pearance that it is working under its own power. Very novel, George. I'm sending you a check for $3 today.

***

A $3 award was made to Rene Matthey, of Toronto, Canada, who sent in the photo below, showing himself in the kyack he constructed from plans that appeared in the August (1938) issue. His "water bug" cost only $15 to build and its performance and ease of handling so impressed a group of local young men that they are going to form a club and build similar kyacks for use next summer. You certainly must have turned out a good job, Rene, to influence an entire group into building duplicates of your craft.

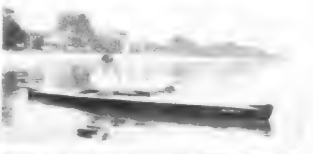
***

One of the best powered scooters ever brought to my attention is shown in the photo sent in by John Minneter, of Evansville, Ind. He built the scooter himself, using welded angle iron for the frame and covering it with sheet steel. A "souped up" washing machine motor delivers $1\frac{1}{2}$ horsepower and, by means of a 4 to 1 gearing, enables the scooter to attain a speed of 40 m.p.h. Okay, John, I'm sending you a check for $3 to buy some gas. You certainly earned it.

***

Every type of powered project seems to hold a lure for the average MI craftsman—midget racers, powered scooters, powered lawn mowers, powered

[*Continued on page* 22]



Ready for an afternoon of pleasure, Rene Matthey takes to the water with the kyack he built from MI (August, 1938) plans.

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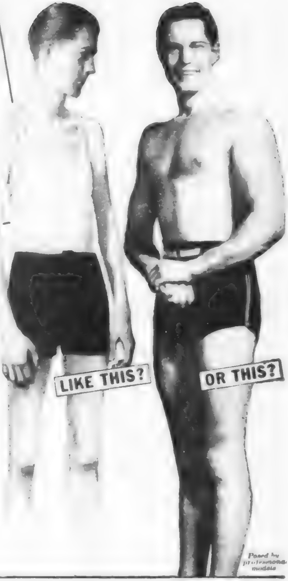
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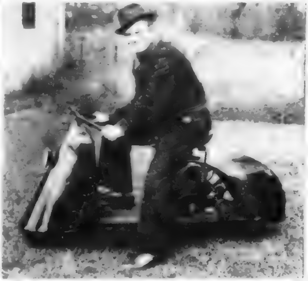
Editor's Workbench Chips

[*Continued from page* 20]



Providing mileage of 110 miles per gallon of gasoline, this trim-looking powered scooter was built by John Minneter. The framework consists of angle iron covered with steel sheets.

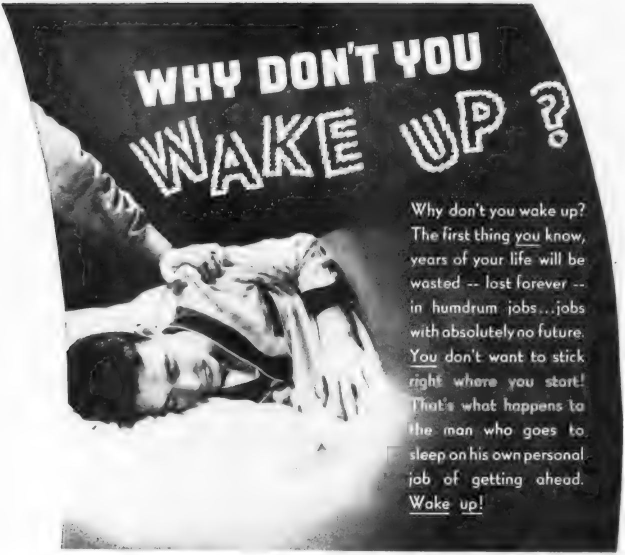
model airplanes, etc. Kenneth Juhn, of Salem, Ohio, is the latest reader to succumb to the gas model plane "fever," as shown in the accompanying photo. Ken's model is powered by a miniature gasoline motor and he reports a five-minute flight after a 30-second engine run. That's a real model flying achievement in any man's language, Kenneth, so I'm awarding you a $3 prize.

* * *

You don't have to take my word for the fact that the 8-foot outboard racing motorboat built by Julius Sabo, of Muskegon Heights, Mich., is fast and seaworthy, for a newspaper clipping he sent

[*Continued on page* 24]

Kenneth Juhn prepares to launch his home-built gas-powered model airplane. He reports a flight of 5 minutes after a 30-second motor run. The model required 150 hours to build.



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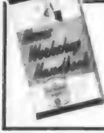

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Editor's Workbench Chips

[*Continued from page 22*]

Speedy in looks and action is the outboard racing motorboat built by Julius Sabo. He crossed Lake Michigan with it in two and one-half hours, covering a distance of about 80 miles.

to me, together with the photo of himself in the boat states that he crossed Lake Michigan (80 miles) in two and one-half hours. VERY good, Julius. MI's check for $3 is on the way to you right now.

***

After reading the Workbench department for years, E. E. Hawkins, finally sent in a photo of a midget racer he built, but failed to include his complete address, so I'll have to hold the $3 check I've awarded him until he sees his photo here and writes to me again. The racer is powered by an old motorcycle engine, which is mounted at the rear, as shown in photo. While the little car was not built for speed, according to Hawkins, it can move along at 50 m.p.h. Say, E. E., what do you mean "not built for speed"?

[*Continued on page 26*]

Mounted at rear, an old motorcycle engine powers this midget racing car built by E. Hawkins. It speeds at 50 m.p.h.

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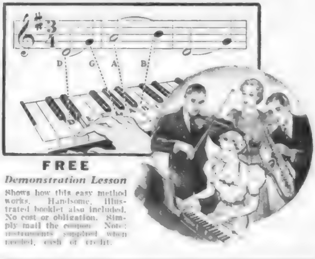

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Editor's Workbench Chips

[Continued from page 24]

Powered by an old auto motor which whirls a 6-foot propeller, this "snow plane," built by W. Hamilton and Syd Prynn, travels at a speed of 40 m.p.h. Body features a round-iron framework, covered with heavy, painted canvas.

As I mentioned before, powered projects have taken the lead in the interest of MI workshop fans. Of late, the mail bags have been filled with letters and photos describing powered scooters, sidewalk runabouts, midget racers, snow sleds. Shown above is the snow sled constructed by W. Hamilton and Syd Prynn, of Calgary, Alberta, Canada. Weighing about 700 pounds, the "snow plane" is powered by an old automobile engine, which whirls a 6-foot propeller, and carries four people at a speed of 40 m.p.h. The body consists of a frame made from bent round-iron of a $\frac{3}{8}$-inch diameter, covered with canvas. Nice work, fellows. Watch for MI's check for $3 in the mail.

* * *

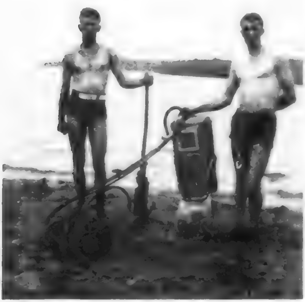
Remember the plans for the sidewalk runabout that appeared in the May, 1938, issue? Well, the photo below shows the daughter of R. L. Keith, of Fort Worth, Texas, driving the runabout her dad constructed for her from those plans. It is powered by an old washing machine motor of the gasoline type and attains a speed of about 12 m.p.h. Including the motor, the runabout cost only $32.06 to build. Certainly is a swell job, Keith. I'm sending you a $3 prize.

[Continued on page 29]

Built to plans that appeared in the May, 1938, issue of MI, this runabout is powered by an old washing machine motor.

Editor's Workbench Chips

[*Continued from page 26*]



Tom Kellner and Fred Lovell have made many successful dives with the underwater helmet they constructed from an old hot water tank, using MI plans.

A well-earned $3 prize was awarded to Tom Kellner and Fred Lovell, of International Falls, Minn., who sent in single letter describing the underwater helmet they constructed. The helmet, as shown in the photograph above, is made from the top of an old hot water tank, the edges being covered by a piece of split garden hose. A double-action pump, picked up in a junk yard, is used as a compressor and a tank from a gasoline stove serves to store the compressed air so that an even flow is fed to the helmet at all times. Tom and Fred report that they have made many dives with the helmet, recovering objects lost overboard from local boats. Accept my compliments for completing a really novel project, fellows. I expect to receive hundreds of inquiries from other MI readers, requesting plans for building a similar diving helmet.

***

Once more I want to warn contributors to the Workbench to be sure and include their complete address when sending in letters and photographs. Many writers fail to do this and I am therefore unable to correspond with them in the event the photos are judged to be worthy of a Workbench prize. Do not clip your photos to your letters as the clip sometimes presses so tightly that it mars the photograph for reproduction purposes. Also—send CLEAR photographs of your projects if you would win an MI check.

***

See you here next month.—*The Editor.*

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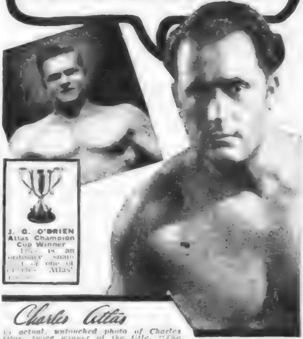
Do YOU Want to Be One?



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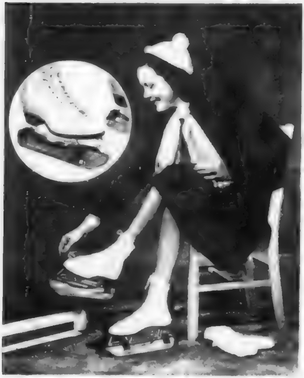

Quickly and easily slipped onto any ice skate by simply inserting the heel of the runner under a positive back strap and pressing the runner into a slot running from front to back through its center, a newly developed wooden "shoe" (inset) enables a skater to don the skates and walk to pond or rink without dulling the blades and keeps feet and shoes dry while walking through snow or slush. The front of the runner is firmly secured by snapping a forward strap shut. The "shoes" are made of natural wax-treated oak.

Glass Insulation May Reduce Size Of Electric Motors

More powerful electric motors, for a given over-all size, are a possibility which improved insulation possible with glass can achieve in the future, according to a well known glass manufacturer. The announcement came in connection with the formation of a new company to exploit the textile uses of fiber glass.

So efficient are glass fibers as insulators, that it will be possible to overload motors 100 per cent, without short circuits and damage to insulation. Thus electric motors of a given horsepower can be constructed one-third smaller in size than those using other insulating materials, it is claimed.

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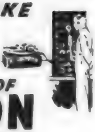

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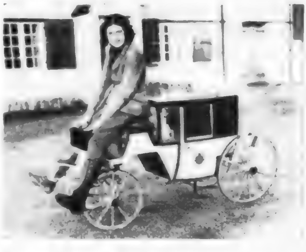
Tom Thumb's Original Coach



Shown above is the original coach used by General Tom Thumb, world famous midget, in 1844. The little man, who was only 31 inches tall, traveled all over the world as a member of the Barnum & Bailey Circus. The coach is now in the possession of Mrs. Reynolds Sams, of Wraysbury, England.

Silk-Like Synthetic Fiber Has Strength Of Steel

Chemistry has created a new synthetic fiber from coal, water and air which has the strength of steel coupled with the fineness and beauty of silk, it has been announced by a well known chemical firm.

The new fiber, claimed to be one of the greatest achievements of industrial research, is expected to be the rival of natural silk in its last remaining stronghold of usefulness—the hosiery trade. Nylon is the new material from which the new fiber is made. It is basically different from familiar rayon in that it does not require cellulose for its production.

Chemically the nylon fibers are polyamides. Like natural silk they have a protein-like structure. Filaments finer than silk or rayon can be spun. The filaments have amazing elastic recovery and great strength. These properties, plus the ability of the fibers to take common dyes easily, forecast the chemists' goal of making sheer, two-thread hosiery with the wearing characteristics of the four-thread, service-weight variety.

But hosiery is not the only application of the new nylon fiber. Because its diameter can be controlled at will it can be produced for a variety of products like brush bristles, racquet strings, fishing lines, woven dress goods, velvets, knitted and woven underwear. It can also be employed as a transparent wrapping film, for plastic compositions, textile finishing agents and coated fabrics. Toothbrushes with the synthetic bristles are already on the market.

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W. H. FAWCETT
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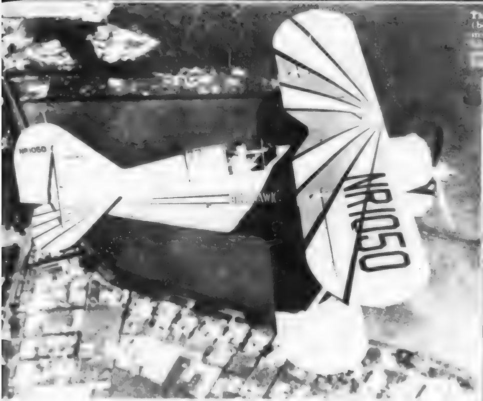
No. 5
March
1939



The close-up of Major Williams (below) gives some idea of his strong physique matched only by his courage in flying. At left he is [illegible] his Gulfhawk flying over [illegible] of the [illegible] there

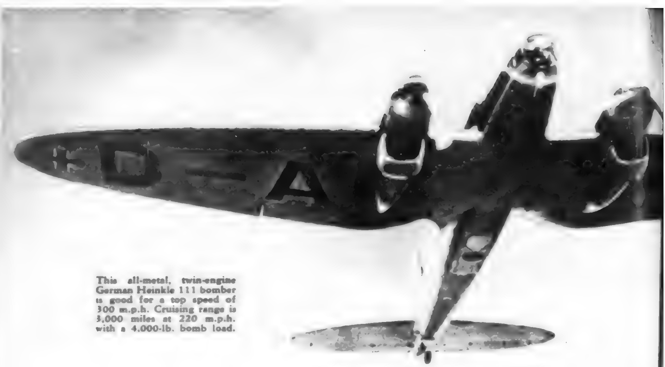
I Flew Foreign War Planes

by MAJOR AL WILLIAMS

Major Williams, ace speed-pilot with a world-wide reputation for his knowledge of fast-flying aircraft, is the only American to have flown a German secret military plane. This article is the first of three dealing with vital military airplane facts recently uncovered by him on tour of European Air Powers.

I FLEW the German Messerschmitt M-109 and I found it the fastest and most maneuverable fighting plane in the world! I don't believe that there's another job in the world that can out-climb, out-speed or out-turn it. I've seen the British "Hurricane" and the "Spitfire" fly, but I'd take the Messerschmitt M-109 any day.

No one outside the German Air Force had ever flown the Messerschmitt M-109. An exception was made in my case. It came about when I was visiting Major General Ernst Udet, the German war ace who now is in complete charge of experimental work for

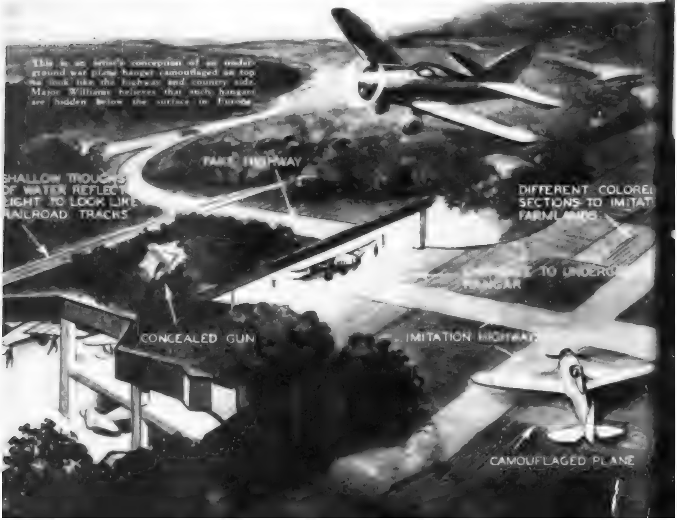


This all-metal, twin-engine German Heinkle 111 bomber is good for a top speed of 300 m.p.h. Cruising range is 3,000 miles at 220 m.p.h. with a 4,000-lb. bomb load.

the German air force. We have known one-another a long time.

We were at Templehof Field, Berlin, where he noticed my own plane, the Gulfhawk. "You know," he said, "that's a neat little ship you have there." I nodded. "I'd rather like to fly it," he continued.

Udet is one of the best test pilots in the world, but until then no one but I had ever flown my ship. However, I wanted to fly the Messerschmitt M-109. We worked on these angles, and decided to make a couple of exceptions. Major General Udet flew my Gulfhawk that day in Berlin. The next day I



This is an artist's conception of an underground war plane hanger camouflaged on top to look like the highway and country side. Major Williams believes that such hangars are hidden below the surface in Europe.

FAKE HIGHWAY
HALLOW TROUGHS
F WATER REFLECT
IGHT TO LOOK LIK
AILROAD TRACKS
DIFFERENT COLORE
SECTIONS TO IMITAT
FARMLANDS
TO UNDERG
HANGAR
CONCEALED GUN
IMITATION HIGHWAY
CAMOUFLAGED PLANE

flew the Messerschmitt at the Kassell field, Germany.

My big moment came when I taxied to the end of the field and turned into the wind. A burst of power, and we were off in about 150 yards. A conservative climb angle carried me to 2,000 feet in a very few seconds. I left the landing gear down to make one practice landing before putting the ship through its paces. That completed easily, I retracted the landing gear and went to work. It answered a finger pressure on the controls. Not too sensitive, but just right. Rolls, tail spins, dives, loops, and sharp turns followed one another in quick succession. Each maneuver was executed at high and low speed. At top speed, the M-109 could be flipped from a steep right bank to a left bank with a light reversal of the control stick. That's the mark of the perfect fighting ship.

A slight dive ran the air speed indicator well over 400 miles an hour while the wing tips and the tail surfaces rode steadily without the sign of a flutter.

A sharp pull-out from a dive blanked out my eyesight, but the ship could take it. She's certainly strong enough. Time and again I marveled at the top speed and the ability to turn.

I dove her straight down from 5,000 feet, leveled out, and raced across the field at about 20 feet. She rode perfectly straight and level. They told me I might have 30 minutes. I took 33 and hated to end the flight. The quick take-off and slow landing puzzled me. But the top speed and ability to turn sharply amazed me.

With years of single-seater fighting ship experience behind me, I've never flown a better plane. The British "Hurricane" and "Spitfire" don't come near it. I compare the British "Spitfire" and "Hurricane" with the German Heinkle 112 and the Messerschmitt M-109 because these are the outstanding fast fighters of the world. *We have nothing that can come near any of them, due to our neglect in the development of streamlined, liquid-cooled engines.*

. A prototype of this Messerschmitt, which I flew, made a world's speed record for land planes last spring, turning up 379 miles per hour. But the Heinkle 112 already has clocked off 394 m.p.h. over an oval course; its straightaway speed is about 420 m.p.h.

—Messerschmitt photo courtesy Aero Digest

This is a commercial version of the Messerschmitt M-109 which Major Williams ranks as the world's best in fighting planes—even better than our own.

The Germans took to flying sailplanes, learned a lot about maneuvering in the air and incorporated what they learned in the crack Messerschmitt M-109.

Against this, the Hawker "Hurricane" (British) is good for about 330 and the "Spitfire" for about 360.

I believe I am safe in estimating these performance figures for the British fighters, because I'm sure that if either one were faster than the German jobs, the British would put them over the speed course and advertise the fact to the world.

Instead, a flight of "Hurricanes" flew from London to Paris at the visit of the English King to France. The best time for the flight, about 250 miles, was and still is held by an American Lockheed — 53 minutes. The Hawker "Hurricanes" took the shortest line with the greatest overwater jump, from London to Paris, and made it in 55 minutes.

Again it's significant that when a Hawker "Hurricane," aided by a tail wind, made a flight between two cities in England, at a ground speed of 408 miles an hour, the British still are advertising this fact with but casual mention that the tail wind was about 70 to 100 m.p.h. in strength.

The British fighters are too big. This explains in part their lack of maneuverability. Again they are handicapped by huge, wooden fixed-pitch propellers, and weighed down with all the guns they can carry. The German Messerschmitt M-109 on the other hand, is smaller, carries fewer guns, and has all the maneuverability that any pilot could ask for.

I tested this feature of the Messerschmitt

The German Storch takes off in a few feet and lands at a speed a little better than a slow walk. It's a high-wing monoplane with slots in the leading edges.

The Heinkle 112 pursuit plane with a 300-m.p.h. speed carrying four machine guns and six 20-pound bombs is Germany's bid for air supremacy.

M-109 by executing the same maneuvers at 100 per cent power, at 75 per cent, and at 50 per cent. At each range, the maneuverability was of the finger-tip quality.

Straight-away speed is not the sole answer to fighting plane efficiency. It is only one factor and must be balanced off by maneuverability. The fire of eight or 10 guns is of little value unless you can aim the guns. This aiming of the guns of a fighting ship is maneuverability.

Maneuverability of another sort got my attention in Kassel, where the Storch airplane was breaking all rules of aviation. The Storch was the plane Emil Kropf later brought to the 1938 Cleveland Air Races. It's a high wing monoplane, and has slots on the leading edges of its wings and flaps on the trailing edges. It takes off in a few feet, and lands at the ground speed little above a brisk walk.

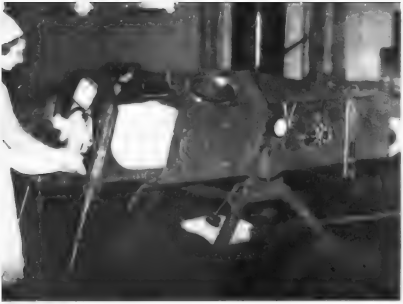
When I flew the ship, the ground run was about 50 feet at full throttle on the 240-horsepower engine. Then the flying nightmare jumped into the air at an angle that had me laying on my back. The air speed indicator read 35 miles per hour. This would have been fatal in an ordinary ship, but the Storch wobbled right on and the controls guided it perfectly.

I pushed the stick forward. The nose of the Storch sank slowly to the ground. I pulled the stick back sharply, and the ship reared on its tail again. I wound up the flaps at the trailing edge of the wings and opened the motor until the speed indicator read 145 miles per hour. That's pretty fast for a ship that can putter along at 35.

When I brought the Storch in, I had the flaps down and the stick back against my tummy. With the ship's nose high in the air, we settled toward the ground. We were descending like an autogiro, with perfect control over the lateral balance of the wings. When within a few feet of the ground, I opened the motor a little and snapped it shut again. The Storch made the last 10 feet practically straight down and within a 50-foot circle marked on the ground.

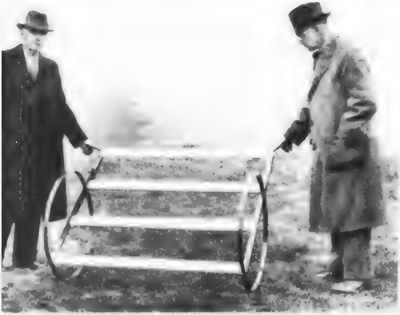
I think the Storch has great possibilities for private flying. It won't stall and spin out of control, and it requires little space for take off and landing. But its job with the German Air Force will be artillery gunfire observation, supplanting the autogiro.

[*Continued on page* 88]



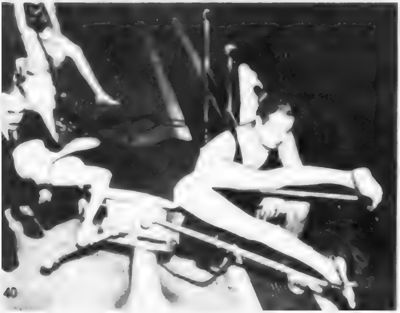
Mechanical Lung Has Wooden Chamber

DEVELOPED in London, England, a new "mechanical lung" respirator device features a chamber made of laminated wood instead of metal, thus facilitating transportation because of its lighter weight. The respirator is mounted on a tripod stand fitted with a worm gear tilting mechanism, enabling the chamber to be slanted at the angle best suited to the patient's condition.



College Coach Invents Safe Track Hurdle

INVENTED by Harry Hillman (right), track coach at Dartmouth College in Hanover, N. H., and perfected with the aid of F. E. Austin, professor of mechanics (left), a new hurdle will tip over when less than one pound pressure is applied to the top bar, preventing injury to hurdlers who strike it during practice or competition events. As shown in photo, the hurdle features a mounting consisting of strap-iron loops, slightly flattened at the base.



Land Device Teaches Swimming Strokes

POWERED by an electrically operated motor, a machine invented by Jesse B. Hudson (left), of Philadelphia, Pa., is designed to provide swimming lessons on land. The student swimmer lies on the machine, hands and feet being strapped to the machine's gyrating "arms" and "legs." When the power is turned on, the machine causes the student's arms and legs to perform the various swimming movements, including the intricate six-beat crawl.

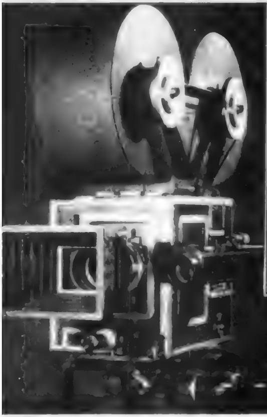
Sets "Flivverplane" Record

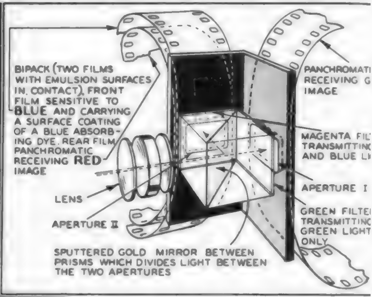
DEMONSTRATING the efficiency of the modern "flivverplane," Johnny Jones (right) of Los Angeles, Calif., flew a 672-pound Aeronca monoplane (above) from that city to Roosevelt Field, L. I., non-stop, in 30 hours, 47 minutes at a cost of less than $25 for gasoline and oil. Powered by a 50-horsepower motor, the plane has a wingspan of 36 feet and an overall length of only 20 feet, making it the smallest airplane ever to complete a non-stop transcontinental flight.

Wrench Has Lockable Jaws

DISPLAYED at the National Inventors' Congress held recently in Los Angeles, Calif., a new type of wrench (left) invented by John Butts, of Cincinnati, Ohio, features a special lock adjustment by means of which the jaws can be locked in place to prevent slippage when applied to a nut.

How the Technicolor Camera Works




BIPACK (TWO FILMS WITH EMULSION SURFACES IN CONTACT), FRONT FILM SENSITIVE TO BLUE AND CARRYING A SURFACE COATING OF A BLUE ABSORBING DYE. REAR FILM PANCHROMATIC RECEIVING RED IMAGE
LENS
APERTURE II
SPUTTERED GOLD MIRROR BETWEEN PRISMS WHICH DIVIDES LIGHT BETWEEN THE TWO APERTURES
PANCHROMATI RECEIVING G IMAGE
MAGENTA FIL TRANSMITTINC AND BLUE LI
APERTURE I
GREEN FILTEI TRANSMITTINC GREEN LIGHT ONLY

Outwardly, the Technicolor camera is an imposing looking machine (left) but not much different in appearance from the regular movie camera. Inside, it is another story (below). Note the triple sprockets for the three films. (Above) Arrangement of the optical system and films in this 3-color camera.

THE basis of all Technicolor movies is the Technicolor camera, of which there are only 14 in existence today. They are valued at $16,000 each, and no one, outside of Technicolor laboratory men, are permitted to examine or operate them.

The camera consists of a big metal box surmounted with two huge containers for triple film reels. Inside is a maze of wheels, gears, springs, filters and hundreds of precision-made moving parts that are the secret of this magical movieland machine. Special high speed, color-corrected lenses are made for these cameras.

Only one lense is used in each camera. Filters break up the colors and pass them on to the three films. The drawing shows the arrangement of the optical parts and the films in this camera. A single film and a bipack are used. A green filter transmits green light to the panchromatic film. A magenta filter inside the camera transmits red and blue light to two films with emulsion surfaces in contact. The front film has a blue absorbing dye and is sensitive to blue only. The rear film receives the red image.

Thus the Technicolor camera photographs the three primary aspects of a scene (red, green and blue) upon three separate film

[*Continued on page* 100]

Aquaplane Features Motor

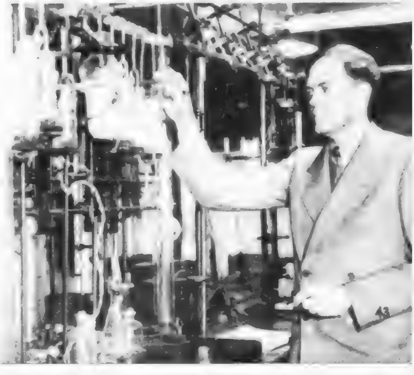
POWERED by a four-horsepower gasoline engine, a mechanical aquaplane (below) invented by Raymond Strawn, of Hollywood, Calif., is said to attain a speed of 25 m.p.h. The novel water device features 26-waterproof compartments, a bilge pump, rudder, throttle control and a gasoline tank which holds two gallons of fuel.

New Golf Club Aids Novice

DESIGNED to teach novice players the proper method of swinging, a new golf club invented by John Homans, a professional player in Boston, Mass., is equipped with a special hinge-spring joint just below the grip. If the player swings the club in the correct manner, nothing happens. However, if the swing is improperly executed, the hinge-spring joint causes the club to "break," warning the player that his swing is not satisfactory. (Arrow indicates hinge-spring).

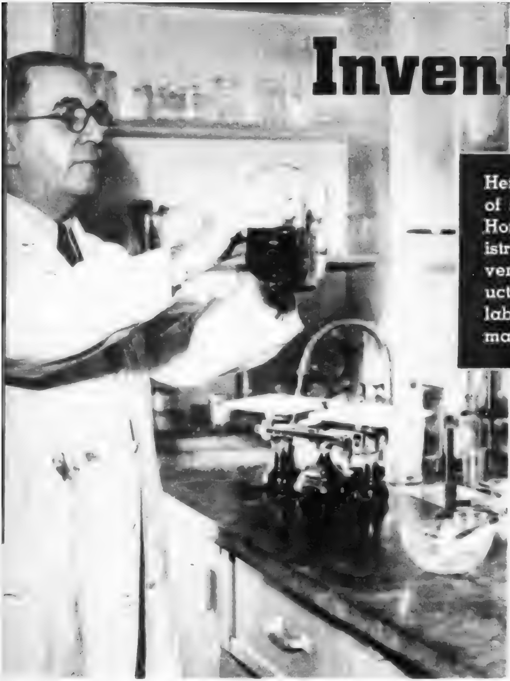
Invents Process For Piping Coal To Mills

DR. ROBERT E. BURK, of Western Reserve University in Cleveland, Ohio, has developed a process whereby industrial mill furnaces can receive powdered coal piped direct from mines located miles away. The process entails the suspension of the powdered coal in a soapy solution, pumping the mixture from mine to mill, where the soap is removed by applying lime. The photo shows Dr. Burk testing the process in his laboratory.



Inventor's

Here is the secret of success of A. E. Horn, a home-chemistry fan, who is inventing new products in his home-laboratory that are making real money.



A. E. Horn is shown in his home laboratory preparing a test-mixture of his "dispersed black." Mixed with the surface of highways, it reduces glare and prevents water freezing. Mixed with soil, it promotes plant growth.

ABRAM E. HORN is a chemist-inventor who is making a fortune in his home laboratory. There, amid an imposing array of chemicals and test tubes, he brews secret formulas that make his fantasies come true. Working with the barest essentials for weighing, mixing and cooking his formulas, he has produced a black compound that reduces glare, absorbs heat and melts icebergs; a highly effective tree paint; a nutrition solution that promotes plant-root growth; a water-white varnish; a secret formula for filtering ultra-violet light. These are the chemistry-inventions of this little man with an active brain whose experiments result in products that make dough—and I mean real money!

This home-laboratory inventor gets his ideas from study, from conversation and from reading everything concerning industry and production. His secret is to study a subject or industry, find a weakness and try to improve on it. So well has this formula worked for Horn that his various chemical inventions have sold to the tune of millions of pounds of material. One of his most recent successes is a product known as "dispersed black" which has been put to a number of practical uses.

It happened one day when this inquisitive inventor with eager brown eyes stopped to observe a Scotch farmer covering his farmland with soot.

Gold!

by Stanley Gerstin

Dissatisfied with available tree paints, Inventor Horn developed one of his own which proved so good that tree surgeons are demanding it everywhere. The tree wound shown above started him on his invention of the new tree product that put him in the money.

Inventor Horn is shown above checking the feeding time of his special nutrition solution that promotes root growth. Below: Vegetables and flowers from ⅓ to ½ again as large have been produced in soil treated with "blackgro." Note difference in size.

"What's that for?" he asked.

"Soot helps farm products to grow," replied the farmer.

The chemist-inventor thought over the farmer's reply. He knew that soot itself was inert carbon and contained nothing that would aid the soil. He puzzled the farmer's action for days. Finally he had an idea. Was the black soot absorbing radiant heat, warming the soil and indirectly promoting the growth of plants? That was it!

So this chemist-inventor went to work in his laboratory at his home in Flushing, Long Island, New York. He produced a special quality carbon black. He discovered a new and hitherto unknown method for dispersing

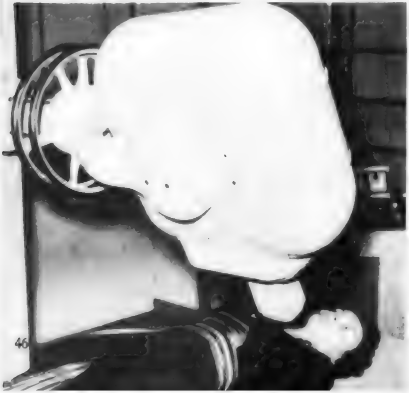
[*Continued on page* 86]

New Aero Lighting System

CONSISTING of a generator developing 250 watts, a two-light revolving beacon, (above) red, white and blue field lights and obstruction markers, a new portable airport lighting system can be packed into the baggage compartment of an airplane for speedy transportation to any emergency landing field where it can be set up in 15 minutes, making the field available for night operation.

Model Train Rated At $3,000

PLACED on exhibition in Los Angeles, Calif., during a recent convention of the National Model Railroad Association, the large model locomotive shown above is valued at $3,000. Powered by steam, the model can actually haul a human passenger and makes an interesting contrast with the small electrically powered model held in the hands of Helen Wood, an actress.

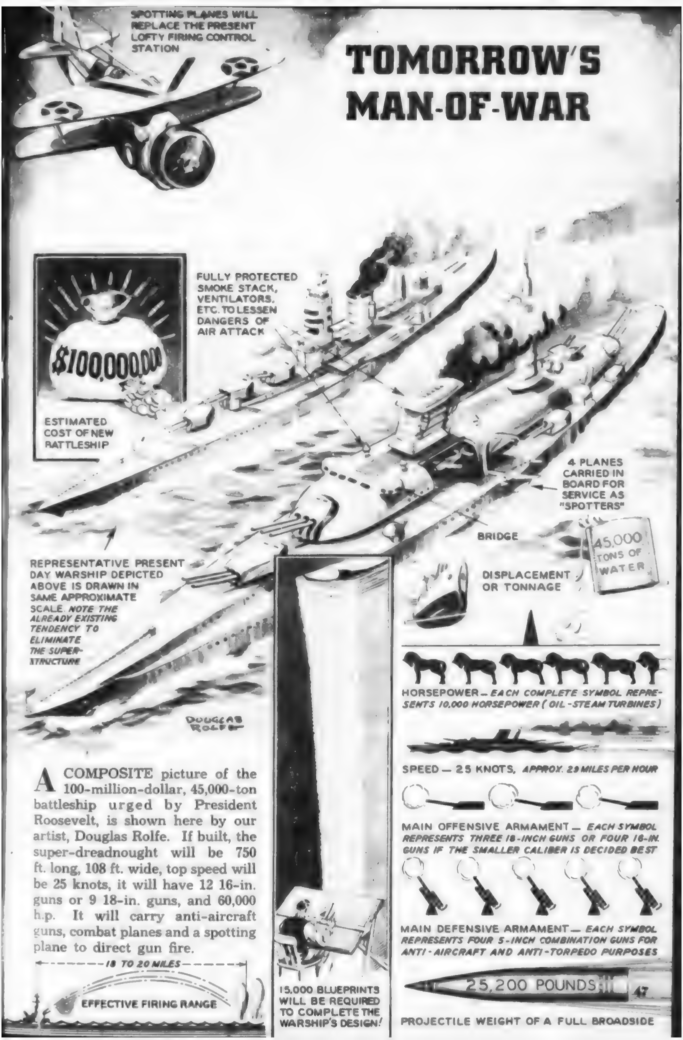


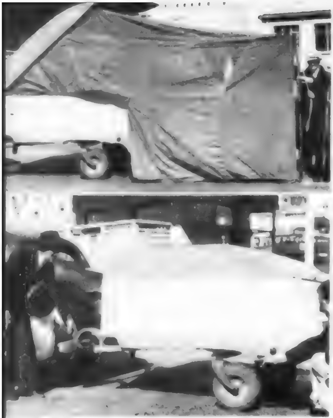
X-Ray "Bomb" Affords All-Angle Radiation

CAPABLE of being handled under all working conditions without danger from high-voltage shock or stray radiation, due to its special design, a newly developed X-ray apparatus can be rotated in all planes, providing radiation in any desired direction. The new "Roentgen Bomb," as the apparatus is known, contains all essentials necessary to cover practically the whole range of X-ray therapy Tube voltage is continuously variable between 50 and 200,000 volts.

TOMORROW'S MAN-OF-WAR

A COMPOSITE picture of the 100-million-dollar, 45,000-ton battleship urged by President Roosevelt, is shown here by our artist, Douglas Rolfe. If built, the super-dreadnought will be 750 ft. long, 108 ft. wide, top speed will be 25 knots, it will have 12 16-in. guns or 9 18-in. guns, and 60,000 h.p. It will carry anti-aircraft guns, combat planes and a spotting plane to direct gun fire.


SPOTTING PLANES WILL REPLACE THE PRESENT LOFTY FIRING CONTROL STATION
$100,000,000
ESTIMATED COST OF NEW BATTLESHIP
FULLY PROTECTED SMOKE STACK, VENTILATORS, ETC. TO LESSEN DANGERS OF AIR ATTACK
4 PLANES CARRIED IN BOARD FOR SERVICE AS "SPOTTERS"
BRIDGE
45,000 TONS OF WATER
DISPLACEMENT OR TONNAGE
REPRESENTATIVE PRESENT DAY WARSHIP DEPICTED ABOVE IS DRAWN IN SAME APPROXIMATE SCALE. NOTE THE ALREADY EXISTING TENDENCY TO ELIMINATE THE SUPER-STRUCTURE
DOUGLAS ROLFE
HORSEPOWER — EACH COMPLETE SYMBOL REPRESENTS 10,000 HORSEPOWER (OIL-STEAM TURBINES)
SPEED — 25 KNOTS, APPROX. 29 MILES PER HOUR
MAIN OFFENSIVE ARMAMENT — EACH SYMBOL REPRESENTS THREE 18-INCH GUNS OR FOUR 16-IN. GUNS IF THE SMALLER CALIBER IS DECIDED BEST
MAIN DEFENSIVE ARMAMENT — EACH SYMBOL REPRESENTS FOUR 5-INCH COMBINATION GUNS FOR ANTI-AIRCRAFT AND ANTI-TORPEDO PURPOSES
25,200 POUNDS
PROJECTILE WEIGHT OF A FULL BROADSIDE
18 TO 20 MILES
EFFECTIVE FIRING RANGE
15,000 BLUEPRINTS WILL BE REQUIRED TO COMPLETE THE WARSHIP'S DESIGN!



Trailer Has Tent "Room"

EASILY unhooked or hooked to any automobile without the use of wrenches or special tools due to a double-arm hook-up device, a new folding trailer (bottom) is equipped with a specially designed tent which, when attached to the trailer and opened up (upper photo), provides a roomy, waterproof camp home. The trailer's wheels are of the swivel-mounted caster type, permitting parking or backing with minimum use of the towing car's steering wheel.

Clipper Vacuums Cut Hair

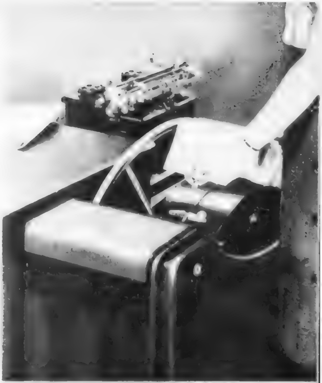
ROY BURNS, managing director of the National Inventors' Congress held recently in Los Angeles, Calif., is shown demonstrating a new type of barber's hair clipper invented by Al Hicks, of Bellflower, Calif. The clipper is fitted with a small vacuum cleaner device which serves to collect the cut hair, preventing it from falling on the floor or over the customer's shoulders.

Model Boat Controlled From Shore By Radio

EQUIPPED with two model airplane gasoline motors and propellers to provide propulsion, the three-foot model speedboat, shown here, was constructed by F. Wellington Morse, of Oakland, Calif., and is controlled by radio. Signals are transmitted to the
from a small radio transm
housed in two tin boxes
signals causing a sensitiv
lay aboard the model to c
ate the steering mecha

Amplifier Violin Is Backless

EXPECTED by its inventor, Marshall Moss of East Orange, N. J., to revolutionize the art of violin playing in public concerts, a new type of violin is backless, being fitted with an electric amplifier device instead. The amplifier serves to make notes, hitherto almost inaudible, easier to hear by the audience and permits the player to stand several feet away from the microphone during radio broadcasts of his program.

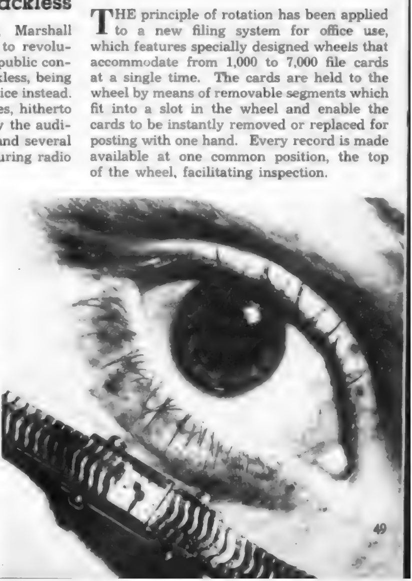


File Cabinet Rotates Cards

THE principle of rotation has been applied to a new filing system for office use, which features specially designed wheels that accommodate from 1,000 to 7,000 file cards at a single time. The cards are held to the wheel by means of removable segments which fit into a slot in the wheel and enable the cards to be instantly removed or replaced for posting with one hand. Every record is made available at one common position, the top of the wheel, facilitating inspection.

Hand-Made Watch Is World's Smallest

MEASURING about one-quarter of an inch wide and five-eighths of an inch long, a tiny watch produced by a Swiss manufacturer is believed to be the smallest in the world and will be placed on exhibition at the New York World's Fair, which opens on April 30th. Comprised of 74 parts, the tiny watch was made entirely by hand. The photo shows the watch as it ap-
when magnified beside a
eye serving as a size com-



Winners In The "MEN WITH WINGS" Contest

The scene above is taken from the thrilling all-Technicolor motion picture "Men With Wings," which prompted the aviation contest sponsored by MECHANIX ILLUSTRATED and Paramount Pictures. Photo shows two Army planes preparing to dive, zoom and stunt over a war-time air base, one of the film's fast-action episodes.

MECHANIX ILLUSTRATED readers certainly possess an admirable knowledge of aviation history, if the hundreds of entries received in the nation-wide "Men With Wings" Contest, which officially ended at midnight, December 27, 1938, are any criterion. However, slight mistakes, made by contestants in answering the 10 test questions enabled the judges to reduce considerably the list of potential prize winners, permitting them to concentrate their attention on the essays on "Who Is Aviation's Greatest Hero?" which accompanied each entry in the contest, as per the rules.

Although the essays were limited to 50 words, many contestants were able to "pack enough wallop" in their entries to convince the judges that the heroes they selected WERE aviation's greatest and therefore they, the writers, should be awarded a prize. The essays sent in by the following persons were judged to be worthy of the 23 prizes offered in the contest, which was sponsored by MECHANIX ILLUSTRATED and Paramount Pictures, producers of the first all-Technicolor aviation motion picture—"Men With Wings," which stars Fred MacMurray, Louise Campbell and Ray Milland, and is now showing at theatres throughout the country.

WINNERS

Winner of first prize—a free round-trip air-line flight to Hollywood, Calif., to meet motion picture stars at the famous Paramount Studios, plus a trip through the Douglas Aircraft Company plant in Santa Monica, Calif., was Howard C. Johnson, of 305½ Second St., Des Moines, Iowa.

Second prize — a completely assembled Baby Cyclone miniature gasoline engine, donated by Aircraft Industries of Glendale, Calif., was awarded to Benjamin Prybys, of 541-49th St., Brooklyn, N. Y.

Third prize—a kit of parts for assembling a six-foot Comet Clipper gas-powered model airplane (less engine), donated by the Comet Model Airplane Company of Chicago, Ill., was awarded to Tom Toner, 212 W. 8th St., Anderson, Indiana.

Fourth prize—an Atwood Phantom miniature gasoline motor, donated by Phantom Motors of Los Angeles, Calif., was awarded

[*Continued on page* 99]

Woman Manufactures Bike Racers' Tires By Hand

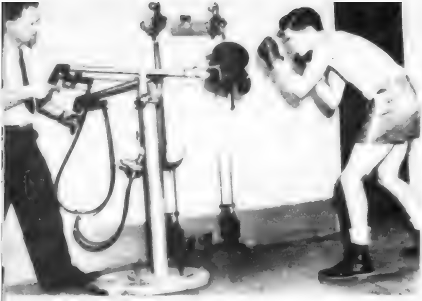
MANUFACTURING special lightweight tires for six-day bicycle riders by hand is the novel occupation of Mrs. Virginia Pye Bailey, of Newark, N. J., shown at work in her shop. Aided by her husband and another assistant, Mrs. Bailey's yearly production averages about 4,000 tires, which are purchased by many of the leading racing cyclists.

"Gas" Motor Powers Grinder

CONVENIENT for use where electricity is not available, a newly developed grinding, polishing, drilling and sanding tool is operated by a self-contained gasoline motor. The tool has a top speed of 3,500 r.p.m. and has a gasoline capacity of two quarts.

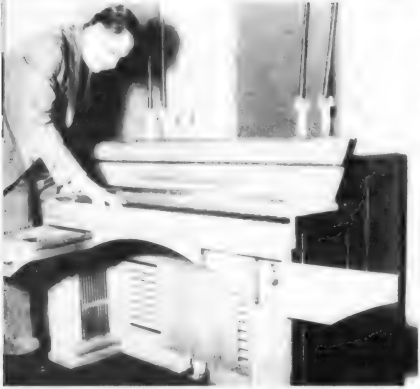
Collects Auto Name Plates

COLLECTING name plates of autos which are no longer being manufactured is the novel hobby of H. E. Sprowls, of Orrville, Ohio. Mounted on a board (above), the display of 200 emblems attracts much attention and tells a story of motoring history.



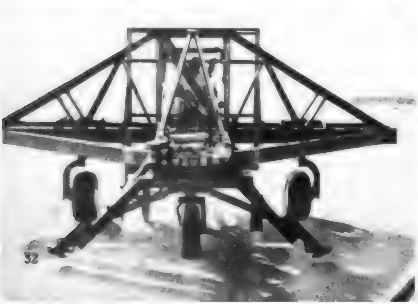
Mechanical "Sparring Mate" Trains Boxer

OPERATED by compressed air, a mechanical "sparring mate" machine invented for boxers by Rev. Frederick Westendorf, of Gary, Ind., features a pair of gloved "fists" mounted on metal arms, which are pivoted to provide a wide radius of action. Pressing triggers at the end of the arms releases the compressed air, which shoots the fists at the boxer in rapid-fire fashion.



Novel Practice Piano Is 4-in-1 Instrument

LACKING a conventional soundboard, a novel piano invented by Arthur C. Ansley, well known radio engineer, has a good tone, but can be used for practicing without disturbing the neighbors because the vibrations do not carry far. At the turn of a switch, the piano is converted into an electronic type, the vibrations being picked up electrically, amplified and reproduced through a loudspeaker in its base. Measuring 3 feet high, 2 feet, 1 inch deep and 4 feet, 6½ inches wide, the piano is also equipped with an electric phonograph attachment and a short-wave radio receiver.



Ground Machine Tests Plane's Landing Gear

TOWED across an airport by a speeding automobile, the apparatus shown at left is used to conduct tests of three-wheeled landing gears of the type now featured as standard equipment on many airplanes to insure greater safety. All possible take-off and landing loads can be duplicated with the apparatus.

First Steam-Electric "Iron Horse" Speeds Over Rails at 125 M. P. H.

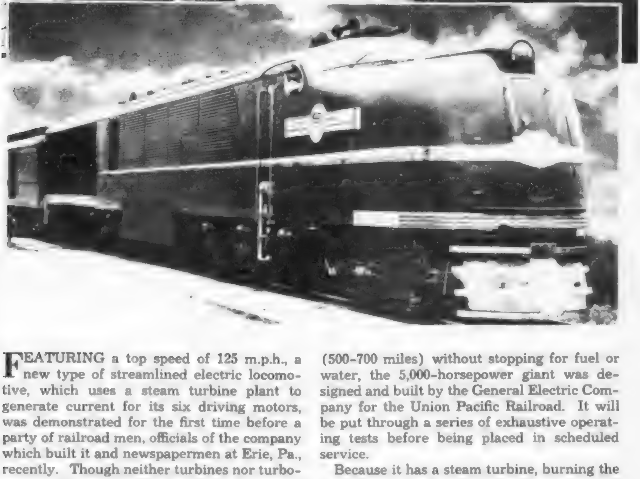
Comfortably seated before the controls (right), the engineer of the new 5000 H.P. steam-electric locomotive has a clear view of track ahead through a wide window.

●

Left — Interior view of the nose of the engine cab showing the controls which automatically regulate the supply of fuel fed to the steam boilers.

●

The two units, which make up the complete two-cab locomotive (below), each weigh 265 tons and are 90 feet long. Electrical braking insures short, but smooth, stops.

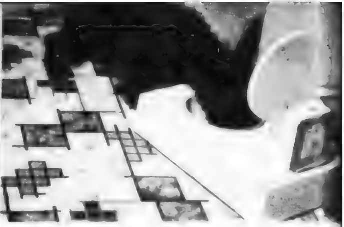


FEATURING a top speed of 125 m.p.h., a new type of streamlined electric locomotive, which uses a steam turbine plant to generate current for its six driving motors, was demonstrated for the first time before a party of railroad men, officials of the company which built it and newspapermen at Erie, Pa., recently. Though neither turbines nor turbo-
lrive in itself is particularly new, it
st time that either has been success-
lied to   on purposes.
as efficie   conventional loco-
nd able   hree times as far
(500-700 miles) without stopping for fuel or water, the 5,000-horsepower giant was designed and built by the General Electric Company for the Union Pacific Railroad. It will be put through a series of exhaustive operating tests before being placed in scheduled service.

Because it has a steam turbine, burning the fuel oil in a fire box instead of in an internal combustion engine, the new "iron horse" operates on a low grade of "bunker oil," which is cheaper than the type of oil required in diesel engines.

Metal Stilts Aid Orchardists

MADE of telescoping aluminum alloy tubes, newly designed stilts enable orchardists to stand from 31 to 68 inches above the ground, facilitating the pruning, thinning and picking of fruit trees (below). A special sheath accommodates pruning shears (insert) and other implements.

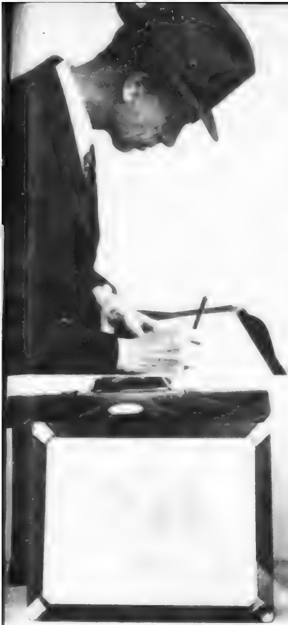


Automatic Device Feeds Pets

ENABLING pets to have their food on time even when their owners are away on dinner dates, a new machine (left) features an alarm clock attachment and can be set to open at any designated hour, thus letting the animal get at food stored inside, as shown in photograph above.

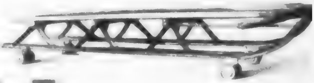
Vacuum Unit Cleans Blinds

FACILITATING the cleaning of the louvers of venetian blinds (above), a vacuum cleaner attachment invented by Basil M. Farrell, of Warren, Pa., has a slit nozzle fitted with rotary brushes which are actuated by the air suction created by the cleaner



Auto Signal Has Double Face

CONSISTING of double-faced fender lamps (above), which are operated by a finger-flip switch mounted on the gear shift knob (insert), a new automobile signal device indicates the direction of the driver's next turn to both approaching and following cars.



Field Drafting Board Fits In Briefcase

INTENDED for use in the field, a new draftsman's drawing board weighs less than one pound and fits conveniently into a brief-case (above). It is so arranged that accurate drawings can be made without the use of the usual T-square (top photo), the only tools needed being an 8-inch triangle, 45x45 degrees. No thumb tacks are used, the paper being held at the corners by spring clamps which are lifted by pressure on small buttons on the back of the board.

Roller Skate Trucks Clamp On Snow Sled

FEATURING trucks which can be detached and applied to the runners of a snow sled by means of adjustable clamps that are tightened with an ordinary skate key (above), permitting use of the sled in an amusing manner — pavement sledding — a new type of roller skate has been invented by Ludwig Depovsek, of Maspeth, L. I. The trucks are readily assembled as regular skates, as shown at left.

Britain's New Air Giant

CONSTITUTING Britain's latest bid for continental air line supremacy, the new 13-ton "Frobisher" airplane, shown on opposite page, is claimed to be the fastest passenger transport plane in Europe, being capable of cruising at a speed of more than 200 m.p.h. while carrying a load of 20 passengers. Powered by four motors of 525 horsepower each, the new giant of the air has a normal range, when fully loaded, of about 1,000 miles. The "Frobisher" is the first of three similar transport planes being constructed for Imperial Airways, Britain's major air line. Together with her projected sister planes, the "Falcon" and "Fortuna," the speedy transport will be placed in cross-channel service by the air line. Unlike American transport planes, the "Frobisher" features a fuselage and wing made of plywood instead of metal. (Photo taken at Croyden Aerodrome, England).

New Sun Dial Design Minimizes Errors

INVENTED by W. G. Brown, of Salisbury, Md., a new type of sun dial swings in a vertical position and its plane is adjusted by a notched arc designed to keep the style always at right angles to the sun at noon, thus reducing the margin of error found in the horizontal stationary sun dials during the various seasons.

Model Midget Racing Cars Go 55 M.P.H.

FROM experience gained in flying gasoline-powered model airplanes and as a result of an intimate study of midget racing cars, Ted Morrison and Don Coad (right), of Oakland, Calif., have constructed miniature midget racing autos that have consistently traveled at speeds of 55 m.p.h. The miniature cars are perfect replicas (lower right) of their prototypes and are 18 inches long with a wheelbase of 12½ inches and a tread of 7¼ inches. Each car is equipped with pneumatic tired wheels of a 3¾-inch diameter. The power units are conventional model airplane gasoline engines which turn up about 14,000 r.p.m. An outstanding feature of each car is a front wheel drive. The tail structure is made of balsa wood while the body and hood are constructed of sheet metal.

10
MECHANIX ILLUSTRATED
THIS MAGAZINE GUARANTEED!
Satisfaction or Double Your Money Back · See Page 58

THIS MAGAZINE GUARANTEED!

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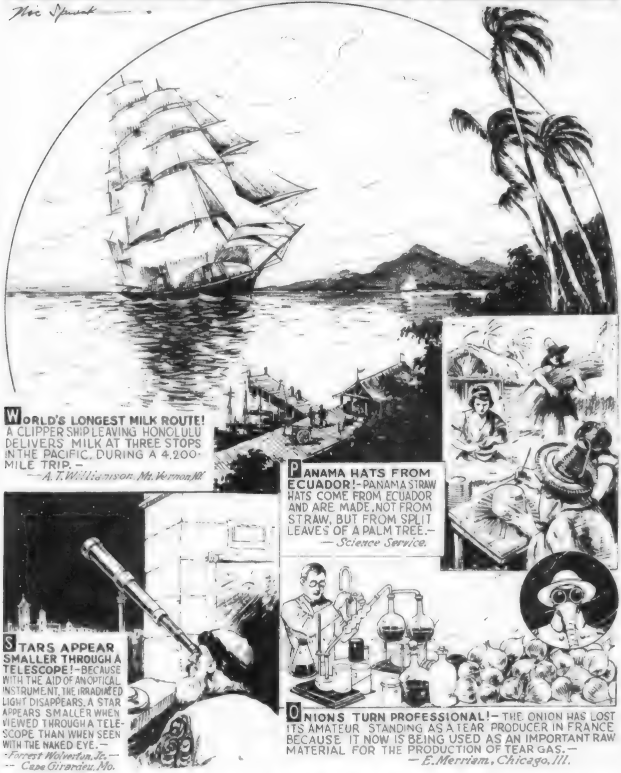
3. THIS OFFER closes March 1, 1939.

LONGEST MILK ROUTE 4,200 MILES LONG
Nic Sprank Offers $5.00 For Best Oddity

Nic Sprank



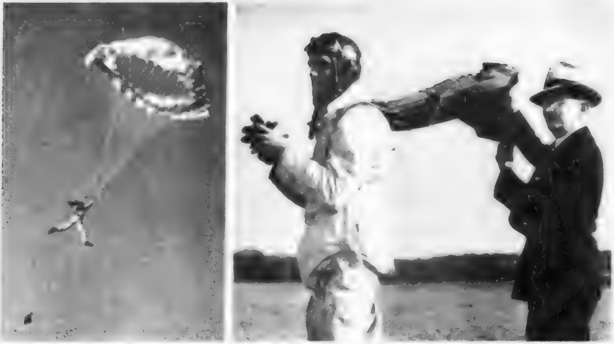
WORLD'S LONGEST MILK ROUTE! A CLIPPER SHIP LEAVING HONOLULU DELIVERS MILK AT THREE STOPS IN THE PACIFIC, DURING A 4,200-MILE TRIP. —A.T. Williamson, Mt. Vernon, N.Y.

PANAMA HATS FROM ECUADOR!—PANAMA STRAW HATS COME FROM ECUADOR AND ARE MADE, NOT FROM STRAW, BUT FROM SPLIT LEAVES OF A PALM TREE.— *Science Service.*

STARS APPEAR SMALLER THROUGH A TELESCOPE!—BECAUSE WITH THE AID OF AN OPTICAL INSTRUMENT, THE IRRADIATED LIGHT DISAPPEARS. A STAR APPEARS SMALLER WHEN VIEWED THROUGH A TELESCOPE THAN WHEN SEEN WITH THE NAKED EYE.— *Forrest Wolverton, Jr.— Cape Girardeu, Mo.*

ONIONS TURN PROFESSIONAL!—THE ONION HAS LOST ITS AMATEUR STANDING AS A TEAR PRODUCER IN FRANCE BECAUSE IT NOW IS BEING USED AS AN IMPORTANT RAW MATERIAL FOR THE PRODUCTION OF TEAR GAS.— *E. Merriam, Chicago, Ill.*

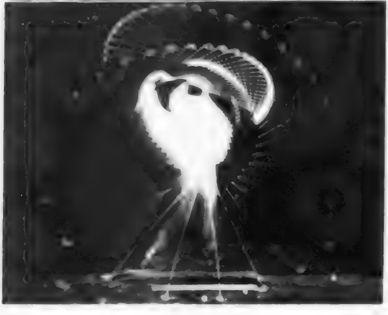
Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Editorial Office, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.



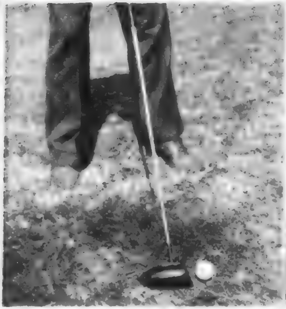
Parachute Opens Automatically When Pilot Jumps

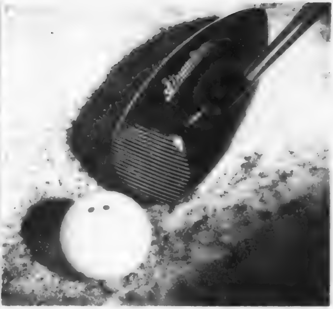
PULLING the ripcord by hand is unnecessary with a new parachute invented by Richard H. Hart, of New Orleans, La. It has a special built-in pocket (above) which bellows out with air when the pilot jumps, pulling the ripcord automatically.

Golfer's Swing Shown In Multi-Flash Photo



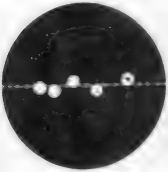
THIS remarkable action photo of Bobby Jones swinging a golf club was taken on a single negative by a new method of flash photography developed by Dr. Harold Edgerton, shown (above left) with his equipment. The interval between "snaps" is 1/100 second and the exposure of each picture is only 1/100,000 second. This extremly short timing is accomplished by leaving the usual camera shutter open and flashing special, gas-filled illuminating lamps with sudden spurts of electricity. The camera is conventional





Streamlined Golf Club Improves Player's Drive

APPLYING scientific principles to the design of golf clubs, Dr. S. J. Crooker, of Purcelleville, Va., has produced a club with a streamlined shape (above) which is claimed to improve a player's drive by a distance of fifteen to twenty yards.

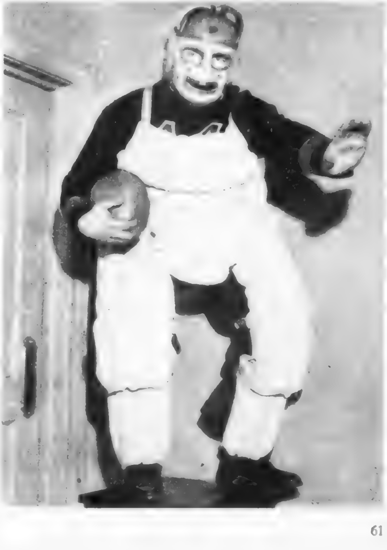


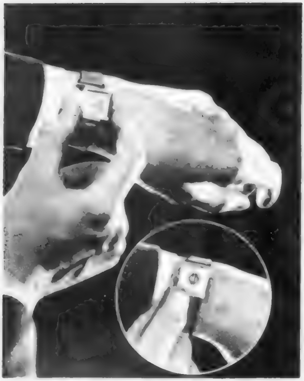
Guess—What Is It?

NO, IT isn't a necklace, but a photomicrograph (600 diameters) of a spider-web thread with five pollen grains of ragweed caught on it.

Protective Football Garb Demonstrated

THE futuristic looking figure at the right is how the football player of tomorrow will appear if he dons all the safety equipment demonstrated at the National Football Coaches Association meeting held recently in Chicago, Ill. The safeguards are mainly for use in practice games



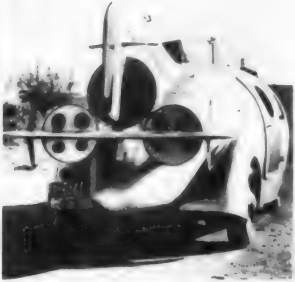


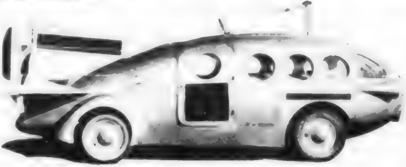
Wrist Watch Turns In Case

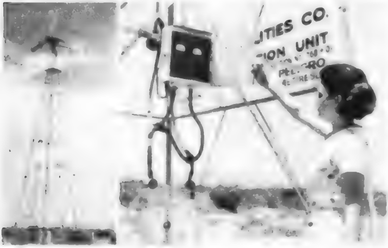
A NEWLY developed wrist watch is mounted in a special case in such a manner that the crystal face can be protected against breakage by merely turning the entire watch around (left), so that the back is in view (inset), without requiring removal from the wrist.

Builds Speedy "Rocket" Auto

RESEMBLING a rocket in appearance and aptly named "Mars Express," the novel auto shown at right was built by Peter Vacca, of Buffalo, N. Y., The car is 20 feet long and is powered by a V-8 automobile engine which provides a speed of 115 m.p.h., according to the builder. To complete the illusion of a rocket in flight, small sky rockets can be set into holes at the rear (top) and ignited to provide smoke and sparks.



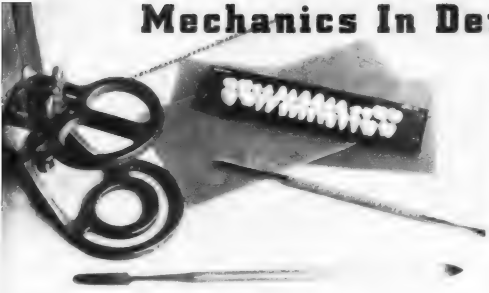




Windcharger Protects Buried Pipe Lines

CONNECTED to buried pipe lines, a powerful new wind-driven generator apparatus keeps the pipe negatively charged for distances up to 10 miles, minimizing the amount of metal usually carried away due to the soil's conductivity. The photos show the windcharger tower (note girl climbing) and the control box at base

Mechanics In Dentistry

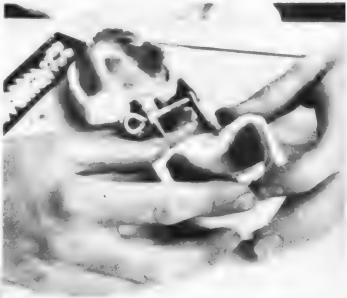


First step in the creation of an artificial denture is the selection of false teeth of the proper shade and size (left). The two small instruments are a spatula which, when heated, is used to form and work the wax base on which the false teeth are mounted, and a wax carver. The hinged instrument is an articulator which reproduces the movement of the human jaws. It is on the articulator that the plate is first made up as a wax mold prior to final production in vulcanized rubber form.

CONTRARY to popular belief, artificial dentures are not always made by a surgeon dentist. It is true that he takes the impression of the patient's jaws, but from then on the work is usually done in a dental laboratory by highly trained technicians, known as mechanical dentists.

When the mechanical dentist receives the impressions from the surgeon dentist, he makes a model of the patient's jaws by pouring plaster into the impressions and removing the impression material after the plaster has hardened. The plaster jaws are then mounted on an articulator, a hinged device

[*Continued on page* 98]



Models of the patient's jaws are made of plaster and mounted on the articulator after which the technician attaches the teeth in place on a wax baseplate by means of lumps of beeswax into which pins on the teeth are stuck (above).

Right—Examples of the mechanical dentist's skill. Upper row shows full dentures, lower row partial dentures. **Above**—Realistic in appearance, the completed wax dentures are now ready for further processing which will finally result in reproduction as plates with vulcanized rubber bases.

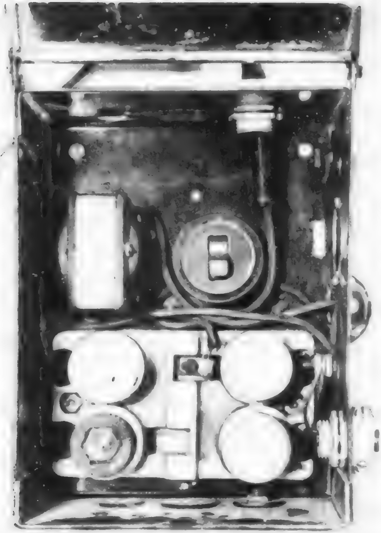
THE MAGIC FENCE

IT WOULD be difficult to design an electric fence control that costs as little to make and operate and is as efficient as the one shown here. By using old electrical parts found around the house the cost should not exceed 50c. Current consumption will average less than 10c a year, according to extensive tests in actual service over a period of six months. There are no moving parts to wear out or become out of adjustment.

The control will supply a harmless but stinging current to miles of single galvanized or barbed wire, keeping livestock and pets confined to desired areas on farms and country homes. A control switch makes it possible to increase strength of the current during dry weather, or to reduce it when the ground is in a moist condition.

The device is unusually economical to operate because the current is consumed only when an animal comes into contact with the fence and closes the circuit. When that hap-

Above—The single wire shown here is attached with porcelain insulators to stakes driven into the ground. Below—Although offered an ear of corn, the animal has learned not to come too close to the electric fence.



Left—A close-up of the control; the parts are housed in an old fuse box. The three lamps and fuse are at the bottom. The transformer is above at the left.

pens an indicating light flashes on in the control box. As the light flashes only when the circuit is grounded, accidental short circuits at any point of the fencing are made known at once.

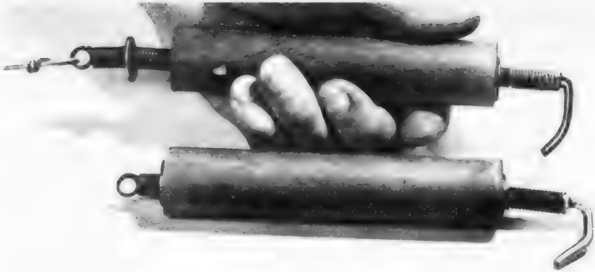
One hundred and ten-volt alternating current is passed through a transformer, with small lamps in the circuit to reduce the current that can pass, and "stepped" up to about 400 volts before it passes to the ground wire and fence. As the amperage is reduced to a safe value the current is harmless excepting for a sharp sting. In actual practice it is found that the control need be in use for only two or three days to "educate" the confined livestock, and that after that time the animals have learned to give the electrified fence a wide berth. This is illustrated by one of the accompanying photographs; although the two wires were not charged at the time the picture was taken, the animal had learned to be wary even when an ear of corn was offered.

An old fuse or switch box makes an excellent housing for the control, and the diagram shows the method of wiring the several parts.

The transformer, with a ratio of 3½ to 1, was removed from an old radio, of which many are available. Raw 110-volt current is not connected directly to the transformer, three 7½-watt lamps and a 6-ampere fuse being wired in series. They are mounted in an old porcelain fuse block, reducing the current before it enters the transformer and providing protection against short circuits in the wiring.

A toggle switch is wired so as to cut one of the lamps out of the circuit, and this is utilized

Right—The control box should be attached to a wall inside the house at any convenient location.

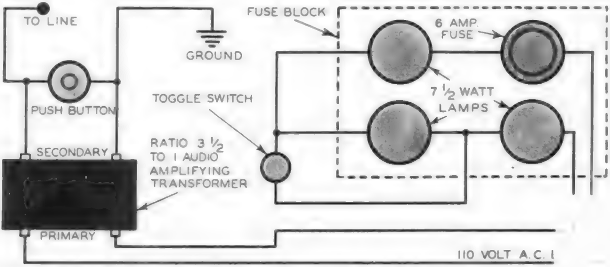


only during dry weather when the earth supplies a less-than-normal "ground." Ordinarily the switch should remain at the "off" position. In excessively dry climates a lamp of greater wattage—up to 60 watts—may be substituted for one of the 7½-watt lamps to increase the current and overcome ground resistance. A push button is mounted on the outside of the box to short-circuit the output in order to learn whether or not the device is operating properly.

When the button is pressed, or when the circuit is closed by contact of an animal with the fence, the 7½-watt bulbs will light. At other times the transformer performs in the same manner as one used in a door-bell circuit and draws very little current from the lines. It is this feature that is responsible for such economical operation.

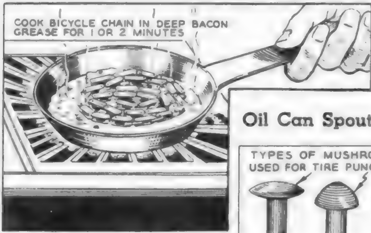
Run the ground wire through a piece of loom and connect it to a metal rod driven deeply into the earth. The fence connection is attached to a bolt passing through a hole in the box, and is insulated from the latter with two fiber washers. This provides a simple but very reliable lightning arrester.

As the wire circuit must be continuous, it is necessary to fit all gates with detachable hooks of some sort. An easily-made pair is shown in the picture above. The insulated handles (which can be grasped without giving a shock) are merely short pieces of broomsticks, drilled through to take lengths of screen-door springs. Bent nails serve as hooks. If the springs are of the painted kind, scrape the ends clean so that the wires attached to them make good electrical contact. Soak the handles in hot paraffin to seal them.



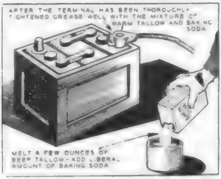
The wiring diagram of The Magic Fence. The toggle switch is used to cut out one of the lamps in very dry weath resistance of the ground is too high to permit the flow of sufficient current. An old audio transformer is sati stepping up the voltage to a point where it will deliver a stinging shock.

Bacon Grease Lubricates Bicycle Chain


COOK BICYCLE CHAIN IN DEEP BACON GREASE FOR 1 OR 2 MINUTES

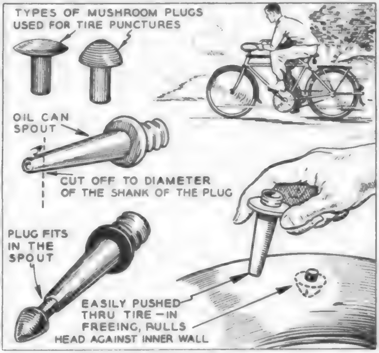
A THOROUGH job of lubricating a bicycle chain may be accomplished by cooking the chain in deep bacon fat for several minutes. The boiling grease penetrates the joints and stays there. This treatment may also be used on a motorcycle chain.—*Hi Sibley*.

Corrosion Preventive For Battery Connections


AFTER THE TERMINAL HAS BEEN THOROUGHLY TIGHTENED GREASE WELL WITH THE MIXTURE OF WARM TALLOW AND BAKING SODA
MELT A FEW OUNCES OF BEEF TALLOW - ADD LIBERAL AMOUNT OF BAKING SODA

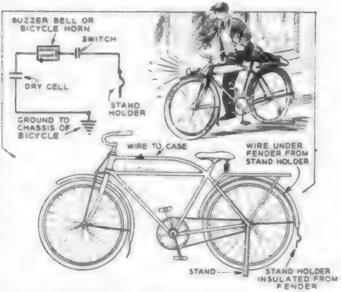
THE simple kink shown in the drawing will positively stop all corrosion on the connections, lead wires and tightening bolts of storage batteries.—*A. H. Waychoff*.

Oil Can Spout Aids Putting Plugs In Tire

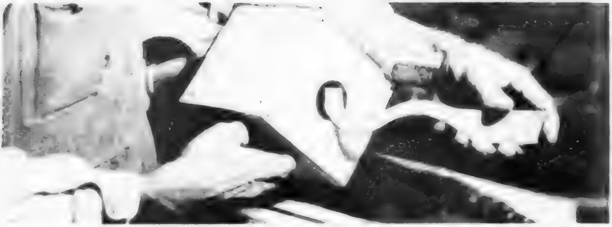

TYPES OF MUSHROOM PLUGS USED FOR TIRE PUNCTURES
OIL CAN SPOUT
CUT OFF TO DIAMETER OF THE SHANK OF THE PLUG
PLUG FITS IN THE SPOUT
EASILY PUSHED THRU TIRE — IN FREEING, PULLS HEAD AGAINST INNER WALL

IT'S quite a job to put an ordinary mushroom type plug in a casing or single tube tire using pliers. With the aid of a spout taken from an old oil can the job is made easy. Coat plug liberally with cement before inserting in hole. Drawing above shows how it's done.—*A. H. Waychoff*.

Bicycle Thief Alarm


BUZZER BELL OR BICYCLE HORN
SWITCH
DRY CELL
STAND HOLDER
GROUND TO CHASSIS OF BICYCLE
WIRE TO CASE
WIRE UNDER FENDER FROM STAND HOLDER
STAND
STAND HOLDER INSULATED FROM FENDER

WHEN leaving a bicycle outside a store or building for a few minutes, it's a lot of trouble to bother with a lock. Here is a simple device that will cause a loud blast to be sounded on the horn if anyone attempts to make off with the bicycle. The circuit should be wired in accordance with the diagram in the drawing. When the thief snaps the stand into its holder, he closes the circuit and the horn blows. Switch had best be located where it is not immediately observable, as on the underside of a frame member.—*Edward Eul*.



Plywood pattern of one-half the mould is used to check trueness of the inside contour. These vases become perfectly symmetrical, have large inside cavities, are fun to make.

CASTING

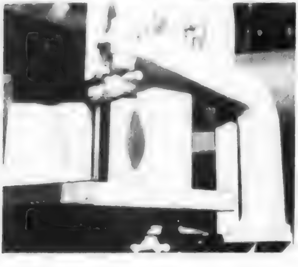
AN INTERESTING and unusual use for your lathe may be found in casting vases. A variety of shapes and designs is possible, as long as they are of symmetrical contour. Once the mould has been made, you can use it over and over. The secret lies in thoroughly impregnating the surface which contacts the plaster with hot paraffin. This prevents the wood from warping, splitting and throwing the piece out of round.

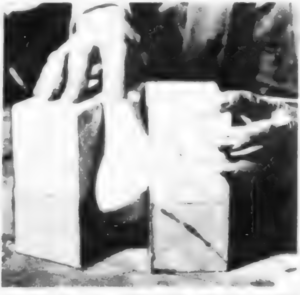
To make the mould for vase types "A" and "B," (see diagram) fit a 6-inch square block of white pine on the lathe face plate. Fasten another block to this, a nail through each corner near the edge. Turn down to the depth shown. Then nail on another block and turn through this until the curved cut is continuous. Repeat this process until you have the full contour of the vase. Using this method permits turning large diameters with a small top opening. If an extra strong mould is desired, glue each block to the next before nailing. Since it is rather difficult to tell accurately just what shape an inside turning is taking, it will pay to cut, from thin wood or cardboard, a pattern of one half the shape and fit this occasionally to the inside.

If each block is sanded as added, the mould will be ready for the paraffin coating after the last segment has been attached. The best way to apply the paraffin is to melt it until quite hot, pour a small quantity inside, then quickly slosh it around until the wood is thoroughly coated. The wax coating serves two purposes. It seals the wood, preventing absorption of moisture from the plaster, and gives the plaster a smoother surface.

Remove the mould from the lathe and bore a hole through each corner as shown, then

Mould has been split in two by the bandsaw. The inside is finished except for pouring of paraffin, each block having been sanded as it was added. Note holes drilled for bolts.





Vase being taken from mould complete except for light sanding and decorating with oils or lacquer. It will lend itself admirably to plants or flowers, being impervious to moisture.

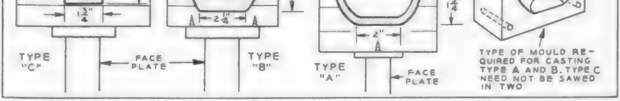
PLASTER VASES

by Dale R. Van Horn

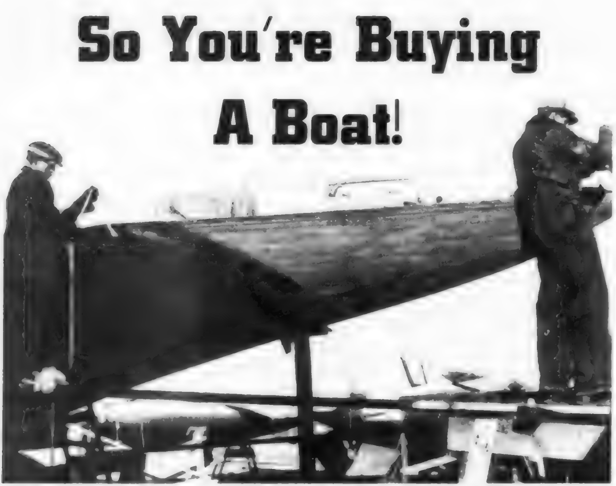
band saw it in two, squarely through the center. The mould is then reassembled by means of bolts fastened through the holes.

Put the mould back on the face plate. Mix some plaster of Paris or better still, Keen cement, since this sets slower. Put a quantity inside the mould and start the lathe at low speed. The centrifugal force will drive air bubbles from the outside surface inward, leaving a vase that will be found almost wholly free from those common blemishes. The spinning of the mould will cause the plaster to leave the bottom, so after the sides have been thoroughly coated to about ¼-inch thickness, remove the mould, set it upright, and put some plaster into the bottom. If the neck of the vase has been evenly coated, you can set the mould away until the plaster has hardened. In type "B," however, the neck is larger, so that if you wish, you can make the walls thicker and after the plaster has set, turn the inside down to suit with ordinary lathe chisels. Should you have trouble in keeping the plaster from working out the front opening, tack a thin piece of wood completely over the opening, and after removing the mould shape the inside of the neck with the fingers. Remove the bolts, pull the mould halves apart, and there is your vase.

Type "C" is simplest of all because the diameter steadily increases from bottom to top, thus making it unnecessary to saw the mould in two. Here, if you wish, the entire mould block can be nailed or glued together before the inside is turned out. But as before, the inside must be sanded smooth and well paraffined. When the plaster has been placed and has set, turn it upside down, tap on the sides and top and the vase will drop out.


WALLS 1/4" OR 3/16" THICK
WHITE PINE BLOCKS
4 1/2"
3 3/4"
3 1/2"
3"
4 1/4"
4 1/2"
1 3/4"
A 2 1/4" A
TYPE "C"
FACE PLATE
TYPE "B"
WALLS ABOUT 3/16" THICK
1 3/4"
3 1/4"
4"
1 3/4"
2"
A
TYPE "A"
FACE PLATE
SCREW OR BOLT HOLES
HEAVILY PARAFFINED
TYPE OF MOULD REQUIRED FOR CASTING TYPE A AND B. TYPE C NEED NOT BE SAWED IN TWO

So You're Buying A Boat!



by Roland Cueva

The active season in the boat market will soon be under way, and if you are one of those contemplating his first investment therein, read this article. It contains many pointers to aid you in getting what you pay for.

MOST boat enthusiasts have, at one time or another, had the desire to construct their own craft. Unfortunately, many lack the time or space necessary for this ambitious undertaking, but there is no reason why they should not have the thrill of owning and working on their own boat, be it operated by paddle, sail, or engine.

The boat yards are full of excellent buys in used craft, and from now until the end of April is the star time for the prospective purchaser, when boats are still up on their cradles, stored for the winter. Acquiring your boat by May 1st also gives you the opportunity to get a good, early start on all the reconditioning, scraping, painting and caulking you're going to do those fine spring Sundays. There were two young business chaps who bought a forty-foot cutter hull in a Connecticut yard early last spring. The planking was in bad shape and needed a lot of work. The boat had a good set of sails but no spars. Hadn't been in the water in three or four years. Things looked pretty black for a launching that summer. But the boys weren't a bit discouraged. They bought a couple of cheap cot mattresses, laid them on the bare bunks, and lived aboard her right there in the yard from Saturday afternoon until Monday morning. They worked like blazes, and not only got her in good shape and overboard, but had the best fun of their lives doing it. Even the Old Timers were surprised.

Here's how to get your search under way. First get a list of all the boat yards you can conveniently visit, because you aren't going to jump at the first boat you see, even though you may think she's your dream-ship. Let's assume that you have already made up your mind as to the type, size, cost, etc. of your d.s., and that you are going in for a small

Sighting along the waterline to see if it's straight and true. Sheer line should also be checked for bumps and variations.

Below: The rot test. If prodding around reveals a spot where the knife penetrates with ease, it means the wood has decayed. Paint can hide rot, but this method will find it. Rot often starts near the keel.

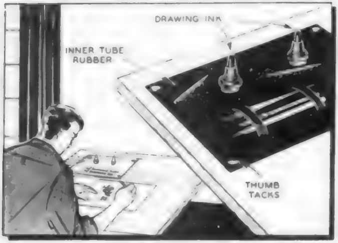
auxiliary sloop, because this will about cover all the points to watch in any other type craft, having both motor and sail. So you wander through the yards, threading your way among the hauled-out boats, wishing this one or that one were for sale because it looks like what you had in mind. Finally you come upon one whose general appearance seems to meet your requirements.

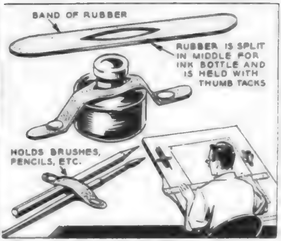
Walk around her and note how she is cradled. In a first rate yard this is no cause for worry, but nevertheless, make sure her keel rests on a firm, even support, and her bottom is braced securely on both sides in two or three places directly opposite each other. Take a position at one end from where you can squint along the waterline, or better still, have two other people stretch a taut string along the w.l. from bow to stern. *The waterline must be perfectly straight.* This is of the utmost importance, as any rise or hump amidships means that she has "hogged," either from improper cradling in the past, or from structural weakness. A sag is naturally just as bad. Boats with long overhangs are particularly susceptible to "hogging."

Next get out a sharp penknife or other instrument, and go underneath her. Press the point of the knife gently but firmly against the planking at various spots. Don't be afraid to do this—it won't hurt the boat. Prod around the garboards (planks next to the keel), transom, and where the rudder post and propeller shaft come through the bottom. These points are particularly vulnerable to rot. If the wood resists the knife thrusts it's sound, but if the blade suddenly penetrates easily beware; that means rot has set in, and

[*Continued on page* 94]

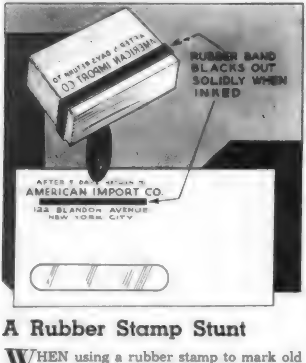
Scraping her down to the wood. Boats with varnished topsides have to have this done at least every spring. Painted hulls do not require such drastic treatment unless the paint has been allowed to get too thick.


DRAWING INK
INNER TUBE RUBBER
THUMB TACKS


BAND OF RUBBER
RUBBER IS SPLIT IN MIDDLE FOR INK BOTTLE AND IS HELD WITH THUMB TACKS
HOLDS BRUSHES, PENCILS, ETC.

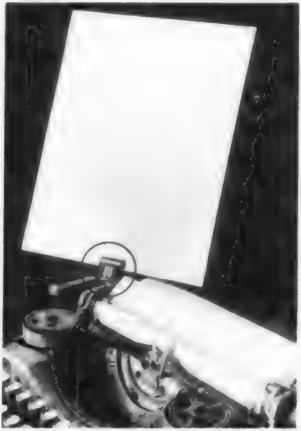
Drawing Board Kinks For The Draftsman

SHOWN above are two methods of accomplishing the same purpose; to keep your drawing ink, pens, brushes, etc., from sliding off the board when you tilt it at an angle, or being knocked off accidentally by a sweep of the arm. Either way is simple and both are effective. In the kink above, a squarish piece of inner tube rubber is cut to receive as many bottles of ink as you wish, and slotted to take the penholders. The whole is then fastened to the board with thumb tacks. At right, a strip of rubber is slotted and pressed over the neck of the ink bottle. Thumb tacks fasten the ends to the board. An unslotted piece holds the pens and brushes.


AFTER 5 DAYS RETURN TO AMERICAN IMPORT CO
RUBBER BAND BLACKS OUT SOLIDLY WHEN INKED
AFTER 5 DAYS RETURN TO
AMERICAN IMPORT CO.
122 BLANDON AVENUE
NEW YORK CITY

A Rubber Stamp Stunt

WHEN using a rubber stamp to mark old stationery, unwanted matter may be deleted at the same time by snapping a thin rubber band around the stamp block so as to cover the censored line. Rubber band takes the ink and blocks out the line.

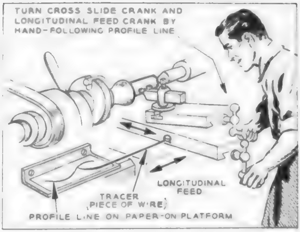


Clip Holds Copy At Eye Level

SPEEDING up duplicate work by having the copy at eye level is accomplished by attaching a small spring paper clip to the space lever on the typewriter carriage. Bend the clip to the proper angle, and fasten by removing the lever screw in the arm and slipping it through the hole in the clip.

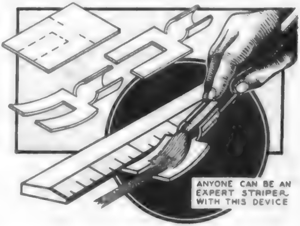
Turning A Contour In A Lathe

HERE is a simple method whereby irregular profile shapes may be turned in a lathe. A tracer is attached to the cross slide and a profile platform attached to the lathe casting. The profile should be traced on a piece of paper and clipped to the platform. The cross slide crank and the longitudinal feed crank are turned manually, simultaneously; combination of these two feeds following the profile line. The tracer wire can be bent in such a fashion that when it splits the line, the proper size of the part being turned is attained.—*Peter F. Rossmann.*


TURN CROSS SLIDE CRANK AND LONGITUDINAL FEED CRANK BY HAND—FOLLOWING PROFILE LINE
LONGITUDINAL FEED
TRACER (PIECE OF WIRE)
PROFILE LINE ON PAPER—ON PLATFORM

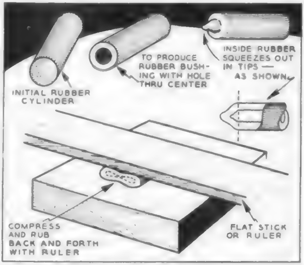
Accurate Striping Device

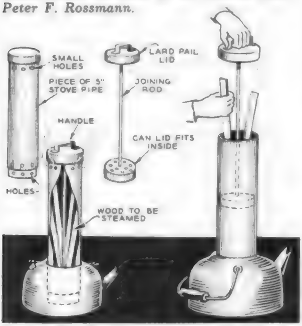
A SIMPLE device whereby anyone may do expert striping is show at right. A small piece of hard thin brass (spring brass is perfect) is cut as indicated by the dotted lines, and attached to the brush as shown. A set of these cut different widths will give you a complete striping outfit.—*A. H. Waychoff.*


ANYONE CAN BE AN EXPERT STRIPER WITH THIS DEVICE

Making A Rubber Bushing

PRODUCING a round hole in a rubber cylinder to make a bushing or insulator is a difficult operation when attempted by drilling. However, a hole can easily be made by compressing the rubber cylinder with a stout ruler, at the same time rolling it back and forth. When tips first appear at the ends, they should be cut off and the rolling continued until the hole is the correct size.—*Peter F. Rossmann.*


INITIAL RUBBER CYLINDER
TO PRODUCE RUBBER BUSHING WITH HOLE THRU CENTER
INSIDE RUBBER SQUEEZES OUT IN TIPS — AS SHOWN
COMPRESS AND RUB BACK AND FORTH WITH RULER
FLAT STICK OR RULER


SMALL HOLES
PIECE OF 5" STOVE PIPE
HANDLE
HOLES
LARD PAIL LID
JOINING ROD
CAN LID FITS INSIDE
WOOD TO BE STEAMED

Steam Chamber For Model Makers

MODEL makers building coaches, ships and aeroplanes as well as other work will find the steam chamber shown in the drawing at left to be a handy tool well worth making. The lid, which brings the wood up with it when raised, makes it easy to get at short pieces for removal.—*A. H. Waychoff.*

BED SHELVES

This handsome shelf sets snugly and firmly on the headboard, holds a lot of things, may be removed simply by lifting.

HERE'S a job, gentle reader, that may strike your fancy, unless you sleep on the floor. Hammock gobs and hitch-hikers, read no farther. These bed shelves are easy to make, don't require much material and really fill a definite need. Especially if you read, or nibble crackers in bed. There is room, too, for a small light and, if you insist, pipe and humidor.

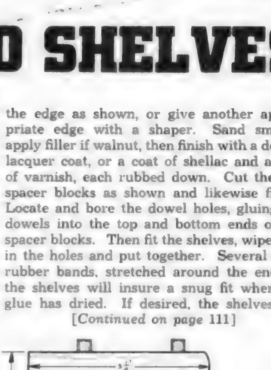
With the special goose-necked, rubber covered hooks, the shelves can be adapted to almost any kind of bed which boasts a fairly high head board. The lower ends of the iron rods are also covered with rubber, so no metal touches the wood. While the size shown is good, the dimensions can be varied to suit or to fit a special need.

Here is what you'll need:

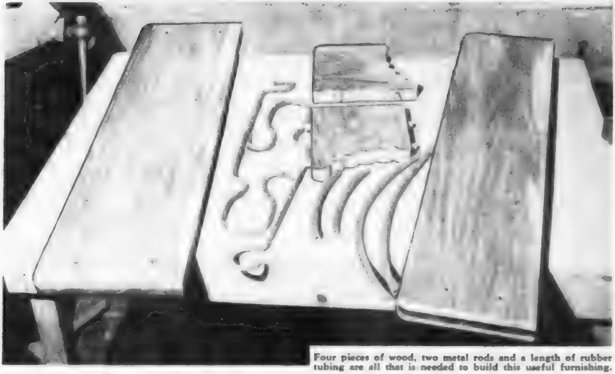
1 piece $7\frac{1}{8}$-in.x$6\frac{1}{2}$-in.x$2\frac{1}{2}$-ft. figured gum or walnut, for top shelf.
1 piece $\frac{7}{8}$-in.x$7\frac{1}{2}$-in.x$2\frac{1}{2}$-ft. figured gum or walnut for bottom shelf.
2 pieces $\frac{7}{8}$-in.x6-in.x7-in. figured gum or walnut for the end spacers.
2 pieces $\frac{1}{4}$-in. iron rod, 3-ft.-0-in. long.
2 pieces rubber tubing, size to fit easily over the rod.
8 $\frac{3}{8}$-in. or $\frac{1}{2}$-in. diameter dowels, 3-in. long.

Round the corners of the shelves and shape the edge as shown, or give another appropriate edge with a shaper. Sand smooth, apply filler if walnut, then finish with a double lacquer coat, or a coat of shellac and a coat of varnish, each rubbed down. Cut the end spacer blocks as shown and likewise finish. Locate and bore the dowel holes, gluing the dowels into the top and bottom ends of the spacer blocks. Then fit the shelves, wipe glue in the holes and put together. Several wide rubber bands, stretched around the ends of the shelves will insure a snug fit when the glue has dried. If desired, the shelves can

[*Continued on page* 111]



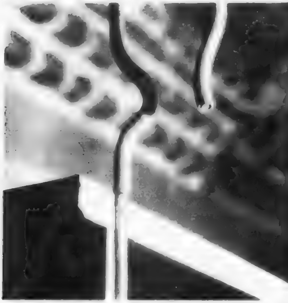
DETAIL OF END SPACER BLOCKS



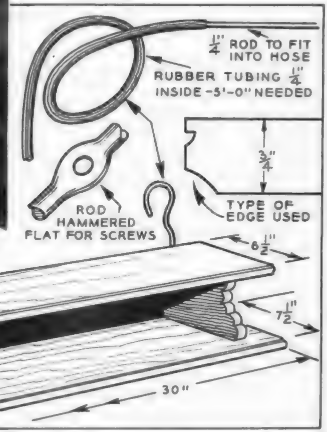
Four pieces of wood, two metal rods and a length of rubber tubing are all that is needed to build this useful furnishing.

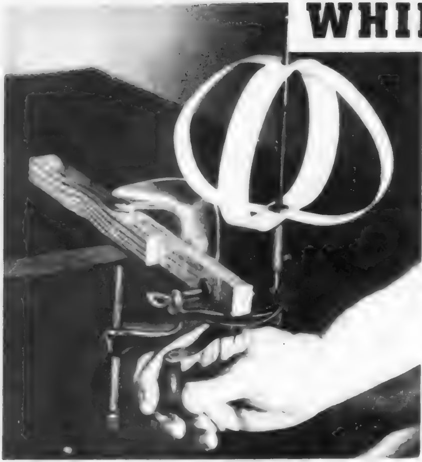
FOR LAZY READERS

by Dale R. Van Horn



Rubber shields bed from being scratched. No metal shows on the finished shelf, the supporting rods being concealed in the back.

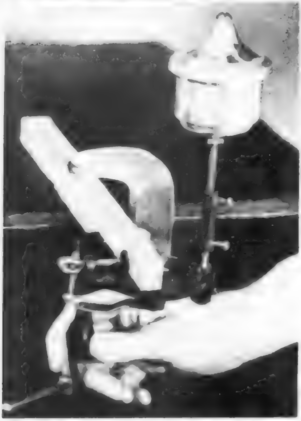

1/4" ROD TO FIT INTO HOSE
RUBBER TUBING 1/4" INSIDE -5'-0" NEEDED
3/4"
TYPE OF EDGE USED
ROD HAMMERED FLAT FOR SCREWS
6 1/2"
7 1/2"
30"
LOWER SUPPORT HOOKS



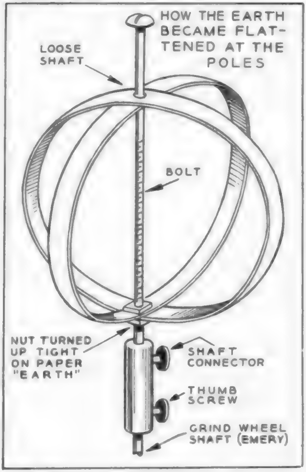
WHIRLIGIGS

by Raymond B. Wailes

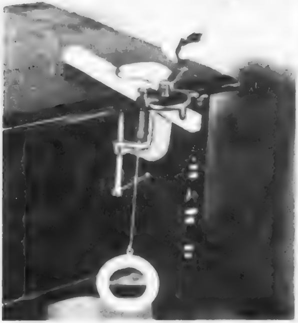
On these pages we bring you some of the many exciting and interesting experiments demonstrating laws of physics, which anyone can easily perform. You can spin the various simply made devices shown here with a hand drill clamped in a vise, or a small rotary hand driven grinding wheel, with the wheel removed, and mounted on a table by means of clamps. The first experiment (left) shows how the earth's rotation may have caused it to become flattened at the poles and bulge at the equator. The four strips of paper, representing the earth, compress themselves into an egg shape when the handle of the grinding wheel is spun. Drawing below details method of constructing the "earth."



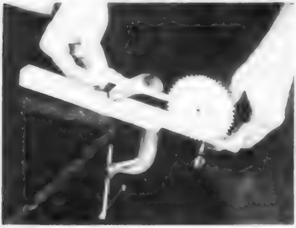
Fasten the tea brewer to the shaft, fill with wet cloth and spin. Watch out for the splash as the water is whizzed out of the cloth and through the holes. Centrifugal force is employed in this manner to whirl the water from wet clothes in laundries.

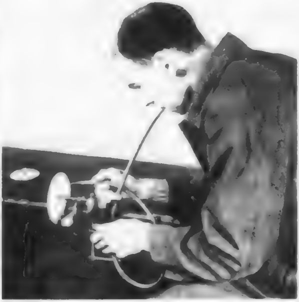

HOW THE EARTH BECAME FLATTENED AT THE POLES
LOOSE SHAFT
BOLT
NUT TURNED UP TIGHT ON PAPER "EARTH"
SHAFT CONNECTOR
THUMB SCREW
GRIND WHEEL SHAFT (EMERY)

SHOW PHYSICAL LAWS



Curtain ring can be made to change the plane of its axis by spinning. Practically everyone has seen the cowboy do this with his lariat, probably unaware of the reason for his rope's antics. This shows that the shortest diameter of any object tends to become the axis of rotation when it is twirled. The little toothed disc below cut from cardboard (called Savart's wheel) will emit a tone when a strip of cardboard is held against the rotating teeth. Press lightly so teeth won't break.

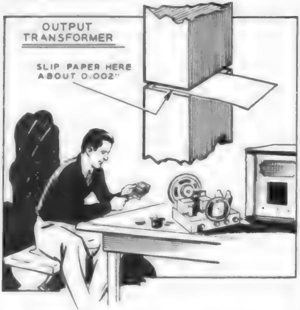




Another method of creating several musical notes by means of centrifugal force. A perforated disc rotated by a hand drill is blown on through the small nozzle formed by a medicine dropper inserted in rubber tubing. Tone varies with speed.

Place in a dessert glass some colored water, mercury, a ball, chain, paper clip, etc. They will all be thrown as far away as possible from the center of the twisting force. In the case of the colored water or mercury, a band of the material is formed about the widest inner diameter of the glass. The vases described on pages 68 and 69 are cast by this principle.

Improving The Output Transformer

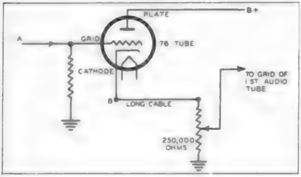


MANY low-priced output transformers generate quite a bit of distortion because of poor iron in the core. Tests have shown that, with a poorly designed transformer, the load on the tube varies throughout the audio cycle, which creates distortion.

The remedy is not necessarily to change the transformer, but to attempt to improve the characteristics of the iron. This is easily accomplished by increasing the length of the air gap by an amount equal to the thickness of a piece of ordinary writing paper. Remove the case of the transformer and increase the air gap with a screwdriver; now slip in the paper and shorten the gap until it just about grips the paper. Replace the casing and the job is finished. In most cases there will be a noticeable improvement in performance.—*B. Goldring.*

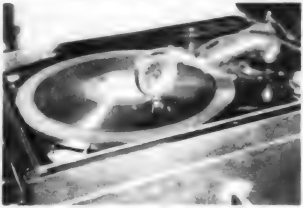
Remote Volume Control

IT IS often desirable to control the volume of a radio receiver or an electric phonograph from a remote point in the house. This cannot easily be accomplished with the usual volume control connection because the distributed capacities of the cable to the control bypasses the high notes and spoils the quality. However, an extra tube can be connected so as to minimize this effect.



The connections are shown in the diagram. Lead A normally goes to the grid of the first audio tube. Disconnect it and make it go to the grid of a 76-type tube; the grid of the first audio tube now goes to the arm of the 250,000 ohm potentiometer, which is the new volume control. Cables several hundred feet long can be used with this arrangement.—*B. Goldring.*

Phonograph Pick-Up



THIS easily-built, inexpensive pick-up equals the tone quality and value of many costly pick-ups. It can be assembled easily from an earphone and an old phonograph reproducer. If you have a large size earphone, be sure to use a large reproducer. Remove the reproducer arm and assembly, and the diaphragm from your reproducer. Take the Bakelite cover from the earphone and drill two holes the same distance apart as the two holes in the brace on the reproducer assembly. Fasten the assembly securely to your earphone cover with the two small screws. Take the diaphragm from your earphone and cut a small circle from it about ¾" in diameter, and glue it to the back of the mica diaphragm out of your reproducer. Then cut the mica diaphragm to fit your earphone. Put a small pin hole through both of these. Take the small screws from the small end of your reproducer arm and put it through this hole, screwing the arm tightly to the diaphragm. If the arm has no small screw in the end, glue it to the diaphragm. Assemble these as shown in photograph, and wire to radio the same as any other pick-up.—*Robert Sattler.*

MECHANIX ILLUSTRATED PHOTOGRAPHY SECTION

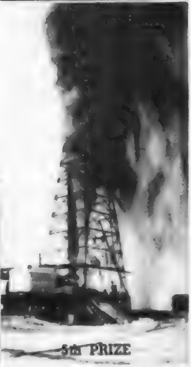
PAGES 79-84

1st PRIZE

2nd PRIZE

3rd PRIZE

4th PRIZE



5th PRIZE

FIRST PRIZE: "HAM", by V. S. Barker, Great Neck, N. Y. Ziess Ikon taken at f.3.6 and 1/25 sec. on Panatomic film, developed in D 72. SECOND PRIZE: "STAR TRAILING", by Emil Pearson, Redgranite, Wisc. 2½ hr. exposure at f.4.5 on Agfa Super Plenachrome with Steinheil camera. Picture indicates rotation of earth while camera points at stars. THIRD PRIZE: "BLOW", by K. Crabill, Fort Wayne, Ind. Seneca view camera, f.4.5 at 1/25 sec. on Portrait film. FOURTH PRIZE: "BLOW", by W. E. White, Plymouth, N. H. Taken with Rolleiflex at f.11 and 1/100 sec. on Agfa film. FIFTH PRIZE: "GUSHER", by M. Campbell, Conroe, Tex. Taken with a 1A camera on 116 Plenachrome film.

MONEY FOR YOUR PICTURES

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice, and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big fussy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully, put your name and address on the back of each, and include postage if you want them returned. Address all contributions to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

Close-Up Pictures With Copy Lens

The two close-up pictures above were made with the wire frame attachment shown at right. Light coat-hanger wire is suggested. The only other parts needed are a small piece of copper tubing and a wing screw to fit the tripod socket.

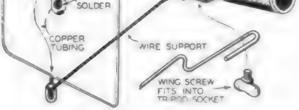
YOU can take unusual close-up pictures with an inexpensive, slip-on copy lens for your camera which is available at most camera dealers. This copy lens changes the focal length of your regular lens and allows you to take pictures at very short distances.

There are two important factors to consider. The regular viewfinder cannot be used at this close distance, and the camera must be placed at the correct distance from the object.

To overcome these two handicaps and to get your close-up pictures properly centered and in focus, use the simple wire frame device shown below. This fastens conveniently onto the camera to mark the correct distance and shows the area to be included in the picture.

Construct the frame from stiff wire as shown. Two measurements must be obtained before making it up. One is the area covered by your camera at a specified distance and the other is distance between object and camera.

This is done by opening the camera and placing a piece of ground glass over the film area and in such position as to show the reflected image when the shutter is open. When the correct area and distance has been determined, measure the distance between the front of the lens and the object. Then construct the arm of the wire frame to this exact measurement. Then it is only necessary to get the object right at the point of the frame to get good close-ups. A distance table is supplied with the copy lens.



PAPER CUTTING GUIDE

by R. M. Angell

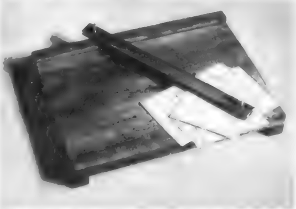
HERE'S a simple guide that substitutes the sense of feel for the sense of sight in the darkroom. It is simple to use, easy and inexpensive to make. Enlarging paper in the standard 8x10-in. size can be cut into four 4x4-in. pieces with enough left over for test strips; into four 4x5-in. sheets or in any other variation of size desired.

The board itself is a 9x12x¾-in. white pine piece braced by cross pieces on the bottom so that it will not warp. Along one 12-in. edge, a ¼x¾-in. lip is nailed securely.

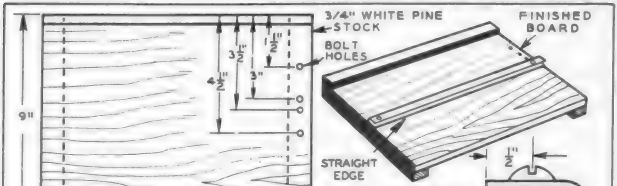
The cutting straight edge is a piece of channel-iron with $\frac{3}{16}$x1-in. machine screws securely fastened in each end. Before these screws are placed, the straight edge is lined-up parallel to the lip on the edge of the board exactly 4 inches from this lip. Then holes are drilled down through the screw holes in the channel-iron into the board itself. This is repeated at 3½, 1½ and at 5-in. from the lip, and at any other distance you want. The screws are then secured in the channel-iron and the threads filed so that the screws will slip into the holes in the board easily.

To cut the paper, drop the channel-iron in place, slip the paper under it until it backs up against the wood lip and cut with a sharp knife in one direction.

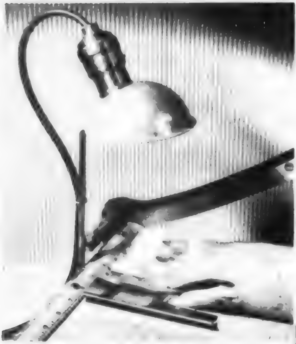
Using channel-iron as a straight edge, the knife is drawn along the outside to make a clean cut edge. Cut with a knife or razor.



Note the pegs in the channel-iron that hold the straight edge in place (above). Construction details shown in drawing below.

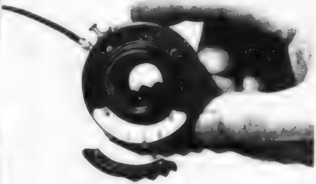

3/4" WHITE PINE STOCK
FINISHED BOARD
BOLT HOLES
1 1/2"
3 1/2"
3"
4 1/2"
9"
12"
STRAIGHT EDGE
1/2"
BOLT AND STRAIGHT EDGE
3/16" X 1" CHANNEL IRON
STRAIGHT EDGE
THREADS ON SCREW BOLT FILED DOWN
3/4"
1/4"
3/4"

Kinks for Camera Fans



Light For Print Trimmer

This light is made from an aluminum dipper, light socket and cord. Fasten the dipper handle to the trimmer as shown and cut a hole in the dipper for the socket.



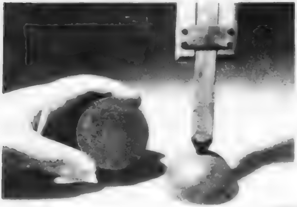
Aperture Scale For Lens

Cut a plate from light sheet brass and substitute the F aperture for US ratings. Use India ink:

f.	8	11	16	22	32
US.	4	8	16	32	64

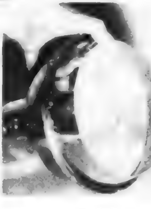
Machine Oil For Sharp Focus

If you coat the ground glass on the etched side with light machine oil, the image will appear much lighter when focusing. This is particularly advantageous when focusing under poor light conditions.



Non-Skid Tripod Base

Slipping of tripod can be absolutely prevented when taking pictures where there are smooth floors, by using sponge rubber. Cut sponge rubber balls in half and use each half as shown above. Sponge rubber holds even on surfaces where rubber crutch tips slip.



Floodlight Visor

When using a large floodlight in a shallow reflector, the bulb projects beyond its sides. To prevent this, cut a section from a mixing bowl and clamp the two rims together with small pieces of metal. This handling will also narrow the beam slightly.

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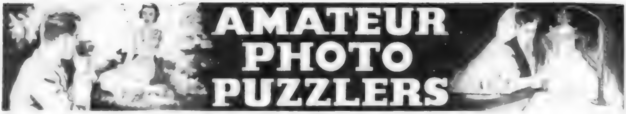

AMATEUR PHOTO PUZZLERS

MULTIPLE PICTURES

Q. What is the method used for making multiple pictures on a single negative?—H. Williams, Philadelphia, Pa.

A. Multiple pictures are made on a single negative by several methods. One method is to use a series of lenses on a single mount. Another is to use a special camera containing a series of lenses inside the camera, all transmitting the image to the sensitized negative at a single exposure. Simple method of multiple photography with the ordinary camera is to use a special dark slide which permits certain portions only of the negative to be exposed at a time. In taking four pictures on a single negative, for instance, cut a mask to cover the dark slide and cut one-quarter of the mask so that when placed in front of a negative, only one-quarter section of the negative will be exposed. Focus the picture on the ground glass similarly divided. Place the mask before the negative in the film holder and slip in the dark slide. Focus the subject on the ground glass in the area corresponding to the cut-out in the mask, pull out the slide and make the exposure. Turn the mask around for the second exposure in the dark room. Then turn the mask up-side-down to expose the upper two quarters of the negative in the same manner that the lower two quarters were exposed. Then develop the negative. This method can be applied to multiple exposures according to the mask used.

MATERIALS FOR ACCESSORIES

Q. What materials are safe to use for making photographic accessories that won't be effected by chemicals?—Charles Cooper, Seymour, Ind.

A. Bakelite, stainless steel and monel metal are generally used in making photographic accessories. These materials can be machined and are therefore suitable for handling in the home workshop.

SPEED OF MERCURY-SENSITIZED FILM

Q. What is the speed of mercury-sensitized film?—Robert Mitchell, Atlanta, Ga.

A. Mercury sensitizing of film has served to increase the speed of film tremendously, but no accurate relative ratings have been arrived at. Those who have had experience in mercury sensitizing claim film speeds have been increased up to 150 per cent. The safest method is to sensitize a strip of film and make test exposures. As long as sensitizing is done under conditions similar to the original experiment, it is safe to follow the increase in speed indicated during the original test.

COLORING PHOTOS

Q. I intend coloring my photographs. What materials should be used?—Roy Sloan, Weehawken, N. J.

A. Small coloring sets made especially for photo purposes may be bought from any camera dealer. To start with, use water color sets, which is cheaper and requires less skill than oil colors. Full directions are included with the materials. The important thing to keep in mind is that only papers of the matte and semi-matte kinds can be colored readily. Avoid glossy paper that has been ferrotyped.

GUM ARABIC FOR RETOUCHING

Q. What is gum arabic and how is it used?—Sid Armstrong, Chester, Pa.

A. Gum arabic is a crystal-like, hard substance that may be easily dissolved. It is used when retouching on glossy surfaces to prevent the retouching material from drying flat. In use, the retouching brush is moistened and brushed across the gum arabic, then dipped into the retouching liquid. When applied on the glossy surface of the paper, the gum arabic deposit will prevent the retouching liquid from drying flat.

CLEARING BATH

Q. Is a clearing bath necessary? What's best to use for such a bath?—G. Miller, Brooklyn, N. Y.

A. A clearing bath is always desirable. It serves to clear or cleanse a negative from the stains of development. An especially good clearing bath consists of 1 oz. of chrome alum, 1 oz. of citric acid and 20 ozs. of water. The chrome alum has a special tanning action on the film superior to ordinary alum frequently used in clearing baths.

DEVELOPMENT AFTER FIXATION

Q. What is the method by which film is fixed first and developed afterwards?—Dan Wheatley, Minneapolis, Minn.

A. Development after fixation is a trick process, long known but not generally used. The film is fixed in hypo so that it comes out clear, like glass. A feature of the process is that film may have 60 times the normal exposure and still develop satisfactory. The only requirement is that film have sufficient exposure. After it is fixed, it may be put away indefinitely, without full development. Development is done in daylight, as such light will not effect the clear film which has an invisible image. When the image is developed, such development takes as long as 12 hours. After that, however, it is only necessary to wash and dry the film.

REMOVING FINGER STAINS

Q. What is the best method for removing grease marks and finger stains from negatives?—Jack Godfrey, Memphis, Tenn.

A. The grease stains on negatives are sometimes no more than finger stains. Small beads of sweat, containing an oily substance, exist at the finger tips and are transmitted to negatives by touching their surface. Rub the part stained with a small tuft of cotton dipped in benzol or alcohol and then bathe the film in methylated spirit and allow it to dry.

DOUBLE DEVELOPMENT

Q. What is the double development process and when is it used?—Ronald White, Denver, Colo.

A. Double development is a processing method that gives the photographer considerable latitude in controlling the degree of contrast of his film and paper. By using two developers of different chemical action, it is possible to increase or decrease contrast in film, build-up detail in the shadows and in the over-exposed areas. By double development it is also possible to use one grade of paper with negatives of different contrast. Double development formulas vary considerably and may be obtained from most photographic handbooks. Some photographers claim that double development lengthens the life of their developing solution and permits fast development without too much contrast commonly experienced with fast acting solutions.

MECHANIX ILLUSTRATED AWARDS $40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of MECHANIX ILLUSTRATED distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the MECHANIX ILLUSTRATED Photography section. Full particulars regarding these awards will be found in this issue on page 79.

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KODAK
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KODAK FILM
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INVENTORS
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Inventor's Gold!

[*Continued from page* 45]

it chemically. He got black carbon on his hands and face, on his clothes and laboratory. He conducted 43 dispersing experiments before discovering his present secret. He would have conducted a hundred, or five hundred to wrest the secret from nature. The variations in his tests were so slight that he might easily have missed the 43rd and gone on to the 44th and 45th. ad infinitum. But patience, imagination, care, were his guardians. He discovered how to disperse the carbon successfully by a chemical dispersion method hitherto unknown.

Now his "dispersed black" is being used by the New York Tri-boro Bridge Authority, and the New York state highway department. A million pounds have been sold in New York state alone. Experiments with it are being conducted in Oklahoma, Maine, and Pennsylvania. The material is mixed with the upper inch of road surfacer because of its anti-glare and anti-water freezing qualities. It is also being used successfully to promote the growth of plants and an experimental garden on the home grounds of Inventor Horn produced carrots, beets, turnips, and a variety of flowers from one-third to one-half again as large as those grown in an untreated patch under identical conditions.

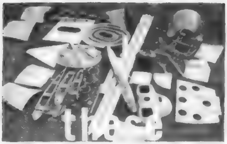
In farming, dispersed black or "blackgro" as it has been nicknamed. is diluted in water 1 to 10 and sprinkled over the earth's surface from a gardening can after the seeds have been planted. Its application is being extended elsewhere and there's no telling where its application may crop up next.

Inventor Horn's big secret is his dispersion method, for which a patent has been applied. (A patent is the first thing Mr. Horn resorts to in order to protect his ideas and inventions). His patent application explains his theory:

"Dispersed black over the soil acts as a lens to collect and concentrate the heat directly over the area where the plant growth is desired. It tends to absorb radiant energy and raise the temperature of the soil. Plant life and its biological processes are directly dependent on the activation of the soil. This may be brought about by bacteria, chemical action or radiant energy and its concomitant heat. Dispersed black aids in the concentration and conservation of this radiant energy."

Like the development of dispersed black, Inventor Horn's tree paint was also the outgrowth of a conversation. It came about after a severe electrical storm had damaged a tree on Mr. Horn's lawn. The tree surgeon, in answer to a question, told Horn what the function of a good tree paint should be. Inquisitive Horn analyzed the tree paint—and discovered that it did not meet even the most lenient specifications. Further examination with other products still left this scientist unsatisfied, so he began experimenting on his

[*Continued on page* 90]



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I Flew Foreign War Planes

[*Continued from page* 39]

The bomber, however, is the striking force of an air power, and the quality and quantity of that type of airplane determines the strength of an air force.

It's my opinion that the all-metal, twin engine Heinkle 111 bomber of Germany is good for close to 300 miles per hour at top speed. Its cruising range is about 3,000 miles at approximately 220 m.p.h. while carrying a permissible overload bomb weight of 4,000 pounds.

These figures aren't quoted from any guide book nor were they filched from any secret file. They are my own appraisal of the ship as I saw it and are based on my study of the design features. I didn't fly that particular job, but a test pilot has a way of anticipating performance. It's his business.

While the Heinkle 111 is the pace-setter in Germany, a comparable bomber in Italy is the Savoia-Marchetti. Three of those bombers, under command of Mussolini's son, made that trip from Rome across the South Atlantic to Brazil at a cruising speed of 257 miles per hour.

It appears to me that the Italians have applied almost all of their high-speed research information to the design of bombers, and while their single-seaters are fast, they cannot compete with British and German ships of the same type. Another defect in the Italian air program is a definite wavering between multi-engined flying boats and long-range, high speed land planes.

Italy's research and experimental center is at Guidonia, on the outskirts of Rome. It is modern and up to date in every respect and is the scientific backbone of the air force.

The towing basin where seaplane floats and hulls are tested is a remarkable set-up. The basin itself is 1800 feet long and about 25 feet wide. Equipped with mechanisms which agitate the water, it simulates conditions of taking off and landing at sea.

A railroad track extends the full length of the basin and accommodates an electric car. An arm extends from the car and on its extreme tip is the mounting mechanism which guides the model airplane through the water. The resistance offered by the floats is measured on a dial in the interior of the car.

I had one ride in this car, and it was a thriller. From zero to 90 miles per hour it went in a few seconds, while I watched a model seaplane skimming along the water, finally to take off by the lift generated by its own wings. Every bit of useful information of that operation was automatically recorded in curves and diagrams.

The Air Force is not an experiment with Italy. She regards it as her first line of offense and defense. More than a dozen years ago General Douhet wrote a treatise on air power as a major factor in wars of the future. Strategists of other nations regarded it as a bit of super-charged

[*Continued on page* 92]

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INVENTORS
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Inventor's Gold!

[*Continued from page 86*]

own. He knew that the Chinese had used tung oil for hundreds of years as a protective coating on sampans because of its water-proof qualities. In combination with gutta percha, it had unusual elasticity. To this he added pinene and sylvestrene, by-product of pine oil. Pinene and sylvestrene were used because he reasoned that an oil possessing characteristics of vegetable origin would be more compatible with tree life. Then he added a little asphalt, mixed the concoction to the right degree and consistency, and produced a tree paint which experiments have shown to be really germicidal. It also prevents fungus growth and other wood-destroying organisms and protects tree wounds against the elements.

The tree paint proved so successful that a dealer in tree surgery materials, after trying it out, ordered 30.000 gallons and angled for sole distribution rights in his field. Then the New York park department became interested and bought 5.000 gallons. Now tree surgeons are clamoring for Horn's tree paint everywhere and plans are being made for manufacturing it, along with dispersed black, for national distribution under the name of A. E. Horn Company, at its Long Island City factory.

Maybe the one-shot inventor would stop at this point in his blooming career and sit back on his earnings, but not Inventor Horn. Now he has another idea by which he is making two products of opposite qualities actually work together. (This one will throw you). It is generally know that aluminum reflects heat as well as light. It is also known that a black material or substance absorbs heat, as well as light. Asphalt, a black material, is commonly used for roofing because of its excellent element-resisting qualities. But 'asphalt coated roofs absorb heat in summer and raise the temperature of the top floor of buildings tremendously.

Inventor Horn's idea was to combine asphalt and aluminum to profit by the weather and heat resisting qualities of both materials. By mixing these two products in his own inimitable way this chemist-inventor succeeded in combining aluminum with asphalt. In liquid form the resulting material appears black, but as it dries after being spread over a roof, the black asphalt settles and the aluminum rises to the surface. When dry the entire surface of the roof is aluminum, with the asphalt underneath. Tests were made on the roof of Mr. Horn's factory with highly satisfactory results.

If you visit Inventor Horn's home you will find this active man of about 55 in his library puzzling over chemical formulas or reading a book on insects by Fabry whom he admires as the man who began life at 65. If luck is with you, this former chemistry instructor may let you in on a secret. That is, he may invite you into his living room. He will lead you towards one side of the room lined with books on either side of a fireplace. He will start looking for a book and just as you get set to inquire what book he is looking for, he will pull a handle and, presto!, the wall of books swings back, revealing a doorway and beyond the doorway a laboratory that is the answer to a hobbyist's dream. In the seclusion of this well-equipped laboratory Mr. Horn spends his spare time writing a symphony of science, making tangible substance of mental theories.

He is a typical tinkerer and whenever he gets what might be a good idea, he tries it out. Right now he is conducting several new experiments. In one corner of his laboratory a plant in a flower pot is being fed by a slowly-dripping liquid simply labeled "nutrition solution." It is a special preparation containing highly nourishing plant food whose action Mr. Horn is studying. Beside it is a tiny plant root in a clear liquid containing "plant hormones." This latter is an experiment in chemical farming.

No man is infallible and even Inventor Horn has had an idea that failed. His outstanding white elephant was an idea for completely filtering out ultra-violet light from show-window glass in order to prevent fading of materials and spoiling of merchandise. He reasoned that the simplest method for doing this was to coat the inside of the show-glass with a filtering chemical. But how to apply that chemical to the glass so that it would withstand washing was a problem.

Mr. Horn decided that a tough water-proof varnish would serve as an excellent medium, but for this purpose he needed a truly water-clear varnish. As no such product was available, he proceeded to produce it himself. To this absolutely colorless mixture he added his secret formula for filtering ultra-violet light, coated a sheet of glass with the liquid and found that it eliminated all ultra-violet light. But—it failed to prove permanent! However, even in this failure, Inventor Horn had learned something and he had produced a product he hadn't originally thought of—a water-clear, water-resisting varnish!

He is full of ideas; thinks that the prospects for individual inventors are as bright as ever, and is a pretty good answer to recent statements made by a well-known industrial magnate that inventing is now a collective business. He proposed a series of questions and problems, each one of which suggested the need for an invention, that ran the gamut of science and physics. He has ideas by the dozen and some day, someone (he says) will find time to work on them and make a million, as well as a great contribution to humanity.

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I Flew Foreign War Planes

[*Continued from page* 88]

imagination, but Italy began using it as a military rule book.

When I was in Italy in 1936, the country already was an air power and at that time had the most deadly bombers in the world—and in quantity. At that time Germany's Air Force was just getting a foothold, and since has moved to the front. But Italy still is a ranking air power, having kept pace in everything but her pursuit ships.

Both the Germans and the Italians are using the unit method for speeding up the production of their airplanes. That method is setting up an electrical system in its entirety on a frame and installing it in the aircraft by a few holddown screws and bolts. The fuselages are built in one shop, the engine mounts in another, the wings in still another, etc. Each of these units, when completed, is sent to an erection shop where their assembly turns out a complete airplane in a matter of hours.

Similar in some respects to the ill-fated British "Shadow Aircraft" production, it succeeds by housing all departments under one roof. The "Shadow" idea was, as you remember, to have the various airplane parts built by widely scattered factories and shipped to an erection point. It was awkward and impractical.

As far as volume production is concerned, I estimate that Germany is not only producing more finished aircraft per unit of time than the British, but also is turning out superior jobs. In one factory I saw 70 bomber wings mounted on electrical jigs slowly moving through a shop. These jigs were tied together, and as one moved, they all moved.

As each unit passed a station, additional manufacturing steps were completed. This type of mass production, similar to the methods of our automobile industry, is also standard in Italy.

I'm not going to estimate the number of ships owned by the air power nations—or any others, for that matter—because I didn't count them. Propaganda of all European nations sets the figures to suit the occasion and the need.

But I'm certainly safe in saying that the "air power" nations do have considerably more first line bombers than their nearest competitors, and, what is more important, the ships are superior in performance and the factories are geared to turn them out like hotcakes.

There are a lot of other things I learned during my tour of European countries in my Gulfhawk, a Navy-type biplane with a 1000-h.p. Wright-Cyclone engine. I learned what foreign countries are doing about camouflage for airplanes as well as for air fields, and what the Germans learned from gliding. My tour began in England where I went in response to Lord Beaverbrook's invitation to participate in the Gatwick Air Show.

My objective in the tour, naturally, was a close-up of the military aviation of Europe and to draw a new total on the development of air power. It turned out that the trip was just a few weeks before the September crisis when two nations were destined to upset the international apple cart because they had a lot of interesting equipment in their hangars.

When I took off from London for Berlin, my pockets were stuffed with clearance papers, and the first leg of my flight was 252 miles to Amsterdam. A few minutes and the English Channel was behind me, with French land below and Dunkirk dead ahead. Dunkirk looks like any other coastal town. But there's an air corridor there; it's marked on the map. I had to fly through it—an air gateway in a country's fence.

Restricted flight is a constant headache to an American airman in Europe. Violation results in the quick presence of a single-seater fighter flying tight formation at your wing tip, or, perhaps, arrest at the next destination. So it's best to stick strictly to the course assigned, and—in the absence of directional beams over there—to keep a sharp eye on the maps.

My time from London to Amsterdam was an hour and 43 minutes, and after clearing the Schipol Airport there, I was on my way to Hanover, Germany. As I boiled along, I began to detect military airdromes not listed on my map. A bit confusing. But for each such field I saw, doubtless there were several that I passed over unwittingly, so clever is the use of disguise.

But sharp eyes aloft are not blanked out entirely by restriction. The nations of Europe have things to hide on the ground and are becoming fascinatingly ingenious at making an airport look like the intersection of highways, tilled lands, or a stretch of level country occupied by railroad tracks—deliberately withholding military identity. Creative minds, skilled in the art of camouflage, scheme for new ideas to make a military airdrome look like anything else but a military airdrome.

Three or four types of grass varying in color, planted in square sections, like ordinary farm lands are examples and mighty deceiving. Tiny, concrete troughs laid like railroad tracks and containing an inch of water, will reflect moonbeams at night to completely allay the suspicions of prying eyes from aloft. These little troughs may well be flush with the ground, and offer no obstruction to aircraft using the field.

I believe the air forces of each country are resorting to underground hangars at military airdromes, and each is afraid the other fellow is doing the same thing. There's no sense in building air power and leaving it lying around in open view, such as using hangars above the ground, where it can be wiped out by fire and light bombs.

It's common knowledge that fighting craft are stored in forests where hangar roofs can be painted as part of the trees, to the complete distraction of an airman a few thousand feet overhead.

Gravel, strewn across airdromes, can be made to look very much like a roadway, which branches from adjacent highways for use by military airplanes. Two such gravel paths complicate the

[*Continued on page 96*]

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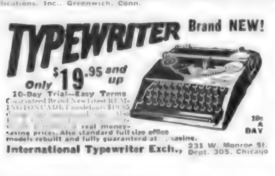

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So You're Buying A Boat!

[*Continued from page* 71]

you're going to have to do some replanking. Look at the seams and note their width. They shouldn't be any wider than ¼-inch. If they are, it indicates that the frame has weaved quite a bit. Practically all sailboats weave to a certain extent when heeling hard on a tack, but this does no harm if they are staunchly built. Sprung seams can be caulked up or battened from inside, but they will leak anyway. Of course, all carvel built (smooth planked) boats open up when cradled for the winter, but steer clear of seams that look overly wide. While you've got your knife out, scrape through the paint in a couple of places to see how many coats you'll have to get off. If the paint is very thick, it will have to be burned off down to the wood. This might be best anyway. Don't attempt this job yourself without practice on something else first. Many is the sadder but wiser amateur who burned more than just the paint!

Now you're ready to clamber up the ladder and have a look at her insides. Before going below you might as well examine the deck, spars (if standing. On smaller boats the mast is usually unstepped and stored indoors along with the rest of the spars), rigging, etc. Don't bother much about the deck, except to be sure it has no weak spots indicative of cracked or sagging beams underneath. It will either be a bare wood deck, caulked, or be covered with canvas and painted. A canvas covered deck is less likely to leak, but has to be repainted every year and eventually needs recovering; on the other hand, a wood deck looks yachtier, doesn't wear out, but has to be caulked and wet down frequently to prevent the seams from opening up under the hot sun. You can take your choice. Look at the hole in the deck where the mast goes through. The mast should be firmly wedged at this point and have a tight "collar" around it to keep the rain from running down into the cabin. The main thing to notice about the spars is that they are straight and sound. The mast should NOT rake, but should point straight at the zenith. Small cracks in the spars running longitudinally are all right, but these are the only kind of cracks that *are* all right. (There are many kinds of trick modern spars now, but space doesn't permit going into those, so the above refers to the old-fashioned solid round sticks.) The standing rigging, (wire) will probably be galvanized, as stainless steel is still beyond most pocketbooks. If it looks fairly clean and not rusty, pass it, because you will probably have to renew some of it in any case. All running rigging (rope) should be replaced even if it appears to be in good condition. Good grade manila is recommended for this. Blocks should be either lignum vitae or bronze.

Among the most important of fittings to check are the chain plates. These are the metal strips

[*Continued on page* 97]

Powerful Radio Transmitter Set Up On "Treasure Island"

West coast broadcasts of regular U. S. programs over high frequencies will be inaugurated with completion of a new short-wave broadcast transmitter W6XBE, (above) now being erected on "Treasure Island," site of San Francisco's World's Fair. The transmitter will be the first of its type west of the Mississippi.

Alternating its operation on duplicate wavelengths, 31.48 meters and 19.56 meters, with two Schenectady, N. Y., stations, the new station will be a powerful factor in this country's bid for listeners in South America and the Orient. Directional antennas of the latest type will concentrate W6XBE's transmitting beams within an angle of about 30 degrees on either South America or the Orient and increase the effective signal strength of the station ten times.

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U. S. Army Air Corps engineers are achieving experimental success in reducing to practicality an old dream of the aeronautical radio engineer—using the airplane's metal structure as the radio antenna instead of using a separate antenna.

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I Flew Foreign War Planes

[*Continued from page* 93]

situation for the peeping airman. But where two of these deception highways intersect on the middle of a hangar roof, with an airdrome planted in three or four kinds of grass of varying shades, laid out in sections like an ordinary farm, an airman can realize that he's looking at a masterpiece of camouflage if he is able to detect the visual key.

Camouflaged planes also are deceptive. The usual scheme is to paint the top portions in blotched colors blending with the ground, while the bottom is colored to blend with the sky. A couple of times I snapped to attention upon noticing a strange blur sliding under my wings—a bomber or a single-seater.

Movement, of course, attracts the eye, but where misshapen tints blend—bomber wing with ground colors—and the outline of a ship is obliterated, the movement is difficult to discover.

The total flying time for the trip, from London to Berlin, was three hours and 23 minutes for the 619-mile air route. That gives you an idea how close the bombers of those two nations are to each other's nerve centers.

Germany is thoroughly an air power nation, a fact I have already pointed out. It was reaffirmed to me time and again as I toured its factories, hangars, and airdromes. One particular flight I made in Germany illustrates the history and theme of the nation's air development. That flight was in a glider, and the glider was Germany's springboard to air power.

The Versailles Treaty and the Locarno Pact prohibited German air power status and restricted the nation to use aircraft engines of less than 100-horsepower. This drove the Germans to intensive development of gliding and sailplane designs. Powerless flying became a popular sport. With all this basic information, it was only a matter of applying what they had learned from the glider to powered airplanes in order to gain the high performance ships they have today.

Darmstaadt is the original home of gliding and sailing motorless planes. I wanted to look over this spot, and flew over one day. As I circled the field, I saw a batch of gliders waiting to be towed into the air. In the center of the field was a group of youngsters, and a glider was being towed off the ground by a thin cable attached to a power plane.

I got the itch to get into a glider myself. I have flown about 100 different types of aircraft but never had had a chance to get aloft in a motorless plane.

As I stood looking around, a chap who fortunately proved to be in charge, asked me if I'd ever flown a glider. "No," I answered, "but I'd like to!" I was practically up.

On signal, the power ship at the other end of the 300 foot cable started away. At first there was a rumbling of the glider's wheels. Later, at 30 feet

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So You're Buying A Boat!

[*Continued from page* 94]

projecting from the deck amidships to which the shrouds supporting the mast are fastened by means of turnbuckles. The load on these is tremendous, since they hold the mast in the boat. They should be *bolted* through the frames or planking to which they are fastened. The further down the sides they go the better, and some builders believe in carrying them clear down to the keel. While this is not strictly necessary, they should go down the sides at least three or four planks when the planking is narrow, or two when it's wide.

A self-bailing cockpit is a great convenience; almost a necessity in boats with heavy ballast, and if you contemplate any off-shore cruising it will be essential. While you're in the cockpit look under the after deck to make sure the main sheet traveler is bolted through the deck and not merely screwed to it. This is important because a terrific strain is continually imposed upon the traveler, and if it gives way in a stiff blow the mainsail and mast will probably go overboard.

Now go into the cabin and take up some of the floorboards. If she's a fin keel boat, examine carefully the large bolts which hold the iron or lead to the fin. If they appear badly eaten away, watch out. These bolts are usually big enough to allow for some corrosion, but your judgment will tell you whether the danger line has been reached or not. Nothing is more embarrassing than to lose one's entire ballast in the briny deep. If she's a centerboard craft, just make sure the trunk looks tight and in good condition. This will leak anyhow, so there isn't much you can do about it. Make a thorough inspection of the inside of the hull, from stem to stern. Frames, ribs and chines should be of white or live oak, and of course not cracked or split. Planking of mahogany, cedar or long leaf pine, preference in the order given. Of course there are other woods that are all right, but those above rank first. Fastenings must be either bronze or hot dipped galvanized. Scrape a couple with your knife to see if they are.

Fittings and equipment depend largely on how you intend using the boat. If you mean to do some cruising, accessories should include: Stove, either Shipmate or Sterno, ice box, toilet facilities, water tank, running and riding lights, life preservers, spare anchor, sea anchor, and charts. Check up to see how many of these you are getting with the boat, and buy what's missing. The spare anchor, running lights, life preservers and charts you must have whether you intend cruising or not.

You will notice that no mention of the motor has been made so far. This is really a subject in itself requiring separate treatment, on which much authoritative information is available, so it won't be gone into here except to say that you

[*Continued on page* 109]

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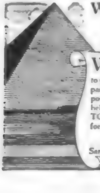

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Mechanics In Dentistry

[*Continued from page* 63]

which reproduces the movement of human jaws.

A baseplate of wax, which will be of the same thickness as the finished vulcanized rubber denture, is applied to the plaster models, being smoothed with a heated metal spatula. False teeth of the desired size and shade are then selected and attached to the baseplate by pressing the pins on each tooth into small lumps of beeswax, which are pressed into position on the baseplate. A touch of the heated spatula serves to unite the baseplate wax and the beeswax, holding the teeth firmly in position.

The dentures now go through a process whereby they are removed from the articulator, placed in a special metal flask, and plunged in boiling water for a few minutes. The hot water melts all the wax, but leaves the teeth held in position by plaster molds.

After being removed from the boiling water, the flasks are re-opened and specially prepared rubber sheets are cut up and placed in the areas formerly occupied by the wax. The flasks are then placed in a vulcanizing machine and the rubber vulcanized. After removal from the flasks after the vulcanizing has been completed, the dentures are trimmed and polished, emerging finally in the state in which they are sold to the patient. So skillfully are some dentures constructed, that it is impossible, in many cases, to detect them from real teeth when worn.

Museum Gets Microphone Used In First Broadcast

The "tomato can" microphone used to broadcast the Harding-Cox election returns on Nov. 2, 1920, generally believed to be the world's first announced broadcast and the start of broadcasting, has been acquired by the U. S. National Museum of the Smithsonian Institution.

The actual microphone used at Station KDKA, then operated by Dr. Frank Conrad of the Westinghouse Electric and Manufacturing Company, the instrument is one of a series presented to the museum by the National Broadcasting Company to show the development of modern microphones.

Known as the "tomato can" microphone because of its metal shielding against noise, the instrument is a carbon microphone. Though a number of other types of microphones have been developed and are widely used today, carbon microphones that are direct descendants of the "tomato can" are still seeing service.

Aviation gasoline was once used only as a standard of comparison of anti-knock values, but last year about two million gallons were made and marketed.

"Men With Wings" Contest

[*Continued from page* 50]

to Crilly Bourke, 126 Rockford St., Charlottetown, Prince Edward Island, Canada.

Fifth prize—a kit of parts for assembling a "Miss America" gas model plane (less engine) donated by the Scientific Model Airplane Company of Newark, N. J., was won by William Bernstein, of 527 N. Walnut St., Youngstown, Ohio.

Sixth prize—a Gwin Aero miniature gasoline engine, donated by the Bunch Model Airplane Co., of Los Angeles, Calif., was awarded to Carl Jacoby, of 8424 Fourth Ave., Brooklyn, N. Y.

Seventh prize—a well known Brown, Jr., Model B miniature gasoline engine, donated by Junior Motors Corporation of Philadelphia, Pa., was awarded to Presley Groves, Elsberry, Mo.

Eighth prize—a kit for assembling a "Maxwell Bassett" gas model (less engine), donated by Megow's, of Philadelphia, Pa., was awarded to H. C. Hubbard, 923 N. Penn Ave., Lansing, Mich.

Ninth prize—a kit for assembling a "Flying Quaker" gas model (less engine), also donated by Megow's, was awarded to Glenn Brown, 117 N. Jefferson St., College Park, Ga.

Tenth prize—a kit for assembling a "Quaker Flash" gas model (less engine), also donated by Megow's, was awarded to George H. Staring, 1220 Newport St., Dallas, Texas.

Eleventh prize—a kit of machined parts for assembling a G. H. Q. miniature gasoline motor, donated by G. H. Q. Motors, of New York, N. Y., was awarded to Claude E. Leibensberger, Jr., 1340 Almond St., Williamsport, Pa.

Twelfth prize—another G. H. Q. motor assembly kit, was awarded to Edward J. Perrin, Rogers, Neb.

Thirteenth prize—a kit for building a Bay Ridge "Mike" gas model (less engine), donated by the Bay Ridge Model Airplane Co., of Brooklyn, N. Y., was awarded to Tom Patterson, 2034 Holt Ave., Los Angeles, Calif.

Fourteenth prize—a Brown, Jr., Model D miniature gasoline engine, including a Polk's Perfect-Pitch propeller with a solid aluminum spinner, donated by Polk's Model Craft Hobbies, of New York, N. Y., was awarded to Conrad Morsch, of Vining, Kansas.

Fifteenth prize—a construction kit for a Silver Streak rubber-powered model plane, donated by the Country Club Aero Supply Co., of Kansas City, Mo., was awarded to Wallace E. Potts, Elk Horn, Iowa.

Sixteenth prize—a kit of parts for building a rubber-powered cabin endurance model plane, donated by the Air-King Model Co., of Portland, Oregon, was awarded to Dean Bartholomew, Box 365, Beach, North Dakota.

Seventeenth prize—a kit of parts for building a 50-inch rubber-powered cabin endurance model, donated by Paul K. Guillow, of Wakefield, Mass., was awarded to Frank Gosztyla, 234 National Rd., Wheeling, W. Va.

[*Continued on page* 100]

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Technicolor Camera

[*Continued from page* 42]

strips, which in turn are developed and processed to equal contrast and in handling are always considered an indivisible group.

From these color-separation negatives, prints are made on specially prepared stock processed in such a way as to produce positive relief images in hardened gelatin. These three hardened matrices in relief are then used as printing matrices that absorb dye. This dye is then transferred by imbibition printing to another film strip, which, when it receives all three transfers, becomes the final color print ready for projection. (The imbibition process is a photomechanical process involving printing from a base relief image as in photoengraving.)

The development of the Technicolor camera and the related processing methods are so highly guarded that the cameras are not sold, but rented to Hollywood studios and the film must be returned to the company for processing.

"Men With Wings" Contest

[*Continued from page* 99]

Eighteenth to twenty-third prizes, inclusive—copies of "Your Wings," an aviation ground school course in book form, were awarded to E. F. Schrafft, of Cromwell, Conn., Julius Nelson, Co. F, 27th Infantry, Schofield Barracks, Hawaii, Nick Vlahakes, 2827 35th Ave., N., Birmingham, Ala., Kalmon Goldberg, Winona Ave., Lincoln Park, N. J., Ray Clarke, Akron, Colo., and Elmer Strothenke, 2501 W. Herbert St., St. Louis, Mo., respectively.

I Flew Foreign War Planes

[*Continued from page* 96]

off the ground, the wheels were cut and dropped, and slowly I was towed to about 3,500 feet.

The flight was normal enough, but the sensitive control of the craft and its superb design capitalizing on every known principle of aerodynamics revealed to me the basis and root of German warplane performance.

The Messerschmitt is a plane that capitalized on every lesson the glider had to teach. The Messerschmitt won the single-seater fighting competition at Zurich some months ago by climbing to 9,000 feet and getting down again in two minutes and four seconds. Think that over, when you listen to or read the blather about high-performing, single-seater fighting planes.

That's the story of air power. There's precious little defense against a determined air attack, as I intend to discuss in another article next month.

The most deadly snake venom, compared drop for drop, is that from the Tiger Snake of Australia.

Start Transcontinental Trip On Powered Scooters

Two adventurous Californians, John F. DeSales and Allen T. Rich, have started a transcontinental trip using powered scooters as a means of transportation. The scooters travel at a top speed of about 30 m.p.h., but the young men expect to take about 30 days to complete the trip, traveling in a leisurely manner. The trip is being made under the auspices of the Golden Gate Exposition in San Francisco, Calif.

Power Of Oil, Gas Engines Doubled In Last 5 Years

The installed power or oil and gas engines has doubled during the last five years, according to Howard E. Degler, University of Texas professor of mechanical engineering.

Diesel engines have spread widely throughout the United States and the rest of the world in all shapes and sizes, from the small individual low-power units introduced by American manufacturers a year ago to 22,500 brake horsepower engine placed in operation in a Copenhagen, Denmark, light plant in 1933.

Improvements during that time include increase in engine efficiency, lowering of weight, decreasing the bulk, increasing flexibility and lowering the per horsepower installation costs, Prof. Degler says.

"One foreign 5500 horsepower engine uses only .329 pounds of fuel per brake horsepower hour with 18,000 British thermal unit fuel, corresponding to a thermal efficiency of 41 per cent," he said. This mans that the engine actually converted more than two-fifths of the energy in the fuel into mechanical work, an achievement of no mean proportions for internal combustion engines. Gas engines, which use a wide variety of gases as the source of their power, also made great progress in this country.

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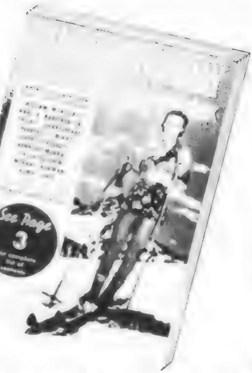

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Photographic "Wallpaper"

Walls of theatres, auditoriums, facades and homes would be literally converted into huge photographic films, then exposed to take a picture which would cover the whole wall in place of conventional panels, plaques, wallpaper or paintings, according to a novel process of decorating walls for which a patent (No. 2,041.853) has been granted to E. Mollo and H. C. Merrett, of London, England.

By their revolutionary method, the inventors claim that a theater could be decorated or redecorated in a single night. The piece by piece application of painted panels, plaques or strips of wallpaper used for decorative purposes would be eliminated. All sorts of artistic, bizarre, and other effects of wider scope than heretofore possible would be obtained more cheaply and quickly, they say. One could test out any combination of decorative schemes right on the premises before the actual decoration or ensemble is put on.

In practicing their method, the inventors first spray the wall with a special plastic paint containing powdered asbestos. This coating of paint has a "bite"; that is, it enables the wall to take and hold fast a light-sensitive photographic emulsion which is sprayed over the painted surface. In this way the wall surface is literally converted into a hugh photographic film, ready to be exposed to some decorative scene.

Any scene to be fixed on the wall can be selected. To expose the gigantic film or "sensitized" wall, the inventors project upon it the selected scene, much as a "magic lantern" or stereopticon throws a scene from a lantern slide onto a screen.

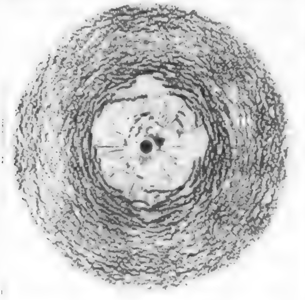
The projected scene is thus photographed on the sensitized wall. It is then developed and fixed by spraying the appropriate solutions on the exposed wall. Toning solutions to give soft, delicate contrasts may also be used. Colored scenes can be photographed on the walls.

After developing and fixing the photograph, it is protected by spraying over it a transparent lacquer. This permits the wall photographs to be washed and cleaned when necessary.

When a housewife burns her finger, how much "nerve current" does the digit need to tell her brain how much it hurts? Electrical research engineers have developed a vacuum tube so super-sensitive that it can measure the tiny current associated with nerve impulses, count the "chips" knocked off atoms by cosmic rays, and determine the acidity or alkalinity of blood. Known only as "RH-507," the tube may help reckon the earth's age by detecting radioactive potassium in rock.

If you are interested in any of the items mentioned in this issue, send a stamped, return envelope for the address of the manufacturer.

Photo Shows Glass Cracking



To prove that when glass is struck and shattered the cracks radiate from the center to form a perfect circle, proof that all cracks move at the same velocity of nearly one mile per second, the unusual photo shown above was made by Professor Harold E. Edgerton and graduate student Frederick E. Barstow of Massachusetts Institute of Technology in Cambridge, Mass. The black spot in the center of the photo is the end of a metal plunger that struck the glass, causing the cracks that radiate from the center. The photo was taken at an exposure of one-millionth of a second.

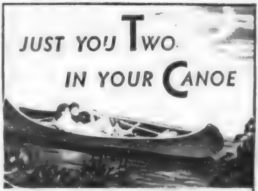
Instrument Aids Solar Study

Sunspots have been searched for new knowledge of conditions on the sun, by means of a powerful new instrument at the Hale Solar Laboratory in Pasadena, Calif.

Sunspots consist of vast clouds of gases, whirled thousands of miles above the sun's surface in tremendous tornado-like storms. Although these clouds are themselves glowing hot, they are so much cooler than the rest of the sun that by contrast they appear as dark spots against the shining disk.

Many metallic elements have been detected in the spots, especially through the lines traced on photographic plates by the ultraviolet and infrared rays they send out, a paper prepared by Dr. Harold D. Babcock of the Mt. Wilson Observatory and read by Dr. Mitchell reveals.

Thus, the lines indicating the presence of silver are stronger for the spots than they are for the sun's disk generally, while the nickel lines are weaker. Strengthened also are lines indicating certain combinations of atoms, such as oxygen with hydrogen, and nitrogen with hydrogen.



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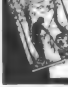

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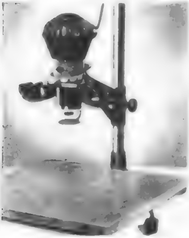

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WE SUCCESSFULLY sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 5-B, Washington, D. C.

WE LOCATE buyers meritorious patented, unpatented inventions. If would accept reasonable cash or royalty, write. Invention Reporter, 4A-11236 So. Fairfield, Chicago. Booklet free.

WANTED patented, unpatented inventions for immediate exploitation to 5,000 Manufacturers. Dept. A, P. O. Box 445, Salem, Indiana.

FORMULAS, PLANS, ETC.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

SUCCEED With Your Products. Make—Sell Them. Formulas. Processes. Accurate, detailed analyses. Catalog free. A. Thaxly Co., Washington, D. C.

10 VALUABLE money making formulas $1.00. If not satisfied, money back. Lancaster Co., Marshall, Texas.

FORMULAS. Latest Money Makers. Literature free. D-Belfort, 4042 N. Keeler, Chicago.

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BUILD your own portable auto hoist. Lifting capacity 2,000-3,000 lbs. Costs $3 to $4 to build. Ideal for small or home garage. Send $1.00 for plans and directions. Babcock Standard Hoist, New Buffalo, Michigan.

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INVENTORS: Sell your unpatented invention with positive safeguards under patent laws. New low-cost procedure. Complete details, free. American Patents Corporation, Dept. 5 E, Washington, D. C.

INVENTIONS Promoted. Patented or Unpatented. Write Adam Fisher Co., [illegible] Enright, St. Louis, Mo.

INVENTIONS WANTED

SMALL Inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. Stanley Hull, 7829 L Euclid Avenue, Cleveland, Ohio.

Molded Welding Hose Eliminates Kinks

Eliminating kinking and taping, a newly developed welding hose consists of two lines, one for oxygen and the other for acetylene, which are molded together to form a single unit. The acetylene line has a bright red cover and the oxygen line is identified by a green cover. The new hose not only simplifies the welding process, but eliminates the unsightly installation which was typical when old style separated hose lines were used.

WANTED—Meritorious patented, unpatented inventions. Booklet free. Invention Reporter, 4B-11236 South Fairfield, Chicago.

CASH for Inventions—Patented or unpatented. Stamp appreciated. Mr. Ball, 9441-F Pleasant, Chicago.

INVENTORS

GET Your Own Patents. Legal blanks, complete instructions $1. Cudding Sons, Campbell, California.

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TRADE present equipment for 1939 Models. Details. Write now. Craftsman's House, 64, Avoca, Pa.

MAGIC TRICKS & NOVELTIES

LOOK! New 1939 Catalog Professional Stage Magic only 10c. Big new catalog 500 Pocket-Parlor Tricks 10c. Each different—get both. Lyle Douglas, Station A-3, Dallas, Texas.

FREE Tricks! Join Magicians' Fraternity! Monthly magazine, sample, 10c. International Magicians, Mt. Morris, Illinois.

WE SUPPLY every noted magician. Large Professional catalog 25c. Holden, [illegible] West 42nd St., New York.

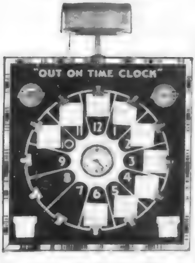
THE Lyle Douglas catalogs are bigger and better than ever. Lyle Douglas, Station A-3, Dallas, Texas.

MALE HELP WANTED

RELIABLE man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to $12 a day. Wonderful new proposition. Particulars Free. Write McNESS CO., Dept. 271, Freeport, Illinois.

AT HOME. Your own manufacturing business, making popular $1.00 novelties. Cost you [illegible] 15c. Everything supplied. Write So-Lo Works, Dept. R-843, Cincinnati, Ohio.

Garage Clock Shows Work on Hand



Hourly graduations projected outward from an electric clock to allow space for the clipping on of slips containing details of jobs to be done are said to speed up garage work. When the customer's order is written up, a glance at the work on the clock makes possible accurate determination of the time at which the job can be turned out. A card is then filled in and attached to the clock in the proper space, making it much easier to get work out on time. An electric lamp at the top serves to keep the clock well lighted.

MISCELLANEOUS

GROW [illegible] 25 cents. R[illegible], 101 E. Main St., Rochester, N. Y.

THE OROSCOPE [illegible] Weight [illegible] grams. [illegible] Hot S[illegible], N. M.

WITHOUT Soil [illegible] flowers, vegetables [illegible] Formula [illegible] S. D[illegible], Box [illegible], M[illegible], Ohio.

[illegible] PLEASURE. [illegible] free [illegible] photographs. Fisher, Palmer [illegible]

MODEL ENGINES

PRECISION engines $2.00. Send [illegible] for description. P[illegible] Novelty Works, 1828 W. [illegible] Place, Los Angeles.

MODEL RAILROADING

BUILD a Model Railroad in 00 gauge ([illegible] inch between rails). A complete catalogue of parts, construction kits, and [illegible] its. One Dime. Nason Railways, P. O. Box 9, Mt. Vernon, N. Y., Dept. [illegible]X

MODEL Railroad Supplies "O" Gauge (¼" scale -1¼" between rails) Freight Car Body Kits $1.00. Illustrated Catalog 10c. Westbrook Co., Hasbrouck Heights, New Jersey.

MODELS & MODEL SUPPLIES

YOUR Ideas developed into practical working model. 30 years successful experience; thousands satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32 page book "Making Inventions Pay." Crescent Tool Company, Dept. T, Cincinnati, Ohio.

MODEL Airplanes 17" Span 8 kits for $1. List 5c. Northern Aircraft, Manitowoc, Wis.

MONEY MAKING OPPORTUNITIES

MAKE Money electroplating! Marvelous patented invention plates with electric brush easy as painting. Does [illegible] permanent electroplat[illegible] [illegible] cadmium, etc. [illegible] No [illegible] weight portable. Anyone can use th[illegible] battery or household current. Only [illegible] complete. Write for details and sample of work done. Warner Electric Co., [illegible] N. Michigan, Dept. D-12, Chicago.

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8 M.M. CHROMOFILM! Guaranteed Finest Quality Reversal! Full Orthochromatic! Weston 8! Complete Processing Included! Two 30-ft. Universal Spools—$1.00! Two 25-ft. "Double 8" Spools—$1.90! Postpaid! Order Now! Chromofilms, 156-B Springfield, Rutherford, N. J.

MOVIE Titles. "The End." 10c Coin. Gard, 418, Madison Sq. Station, New York.

ART films, 8-16 mm. List, sample, 10c. Import-Films, Box 392-X, Elmira, N. Y.

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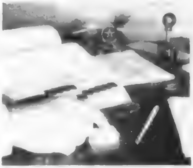
PATENT Your Idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, forty-one years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 103-C, Victor Building, Washington, D. C.

INVENTORS Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 426 Bowen Building, Washington, D. C.

New Office Accessory



Supplied in handy block form, a new chalk-like substance is particularly useful for office clerks, bank tellers, etc., who have to handle numerous sheets of paper. By merely touching the top of the block until a little of the substance comes off on the finger tips, as shown above, the user's fingers can be prevented from slipping when handling the paper sheets.

"INVENTOR'S Guidebook" containing [illegible] mechanical movements and advice about patenting, selling inventions, also "Record of Invention". Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney. L. F. Randolph, Dept. 763, Washington, D. C.

HAVE you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

PATENTS

INVENTIONS Promoted. Patented or Unpatented. Write Adam Fisher Co., [illegible] Enright, St. Louis, Mo.

PHOTO DEVELOPING

OIL coloring photographs a fascinating hobby or profitable business. Learn at home by easy simplified method. Previous experience unnecessary. Common school education sufficient. Send for free information and requirements. National Art School, 3601 Michigan Avenue, Dept. 2043, Chicago, Illinois.

THE Photo Mill. Immediate Service! No Delay! Roll developed, carefully printed and choice of two beautiful [illegible] double weight professional enlargements, one tinted enlargement, or eight reprints for 25c coin. Reprints 2c each. The Photo Mill, Box 629-K, Minneapolis, Minn.

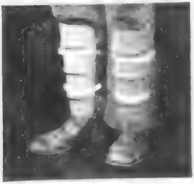
AT LAST! All Your Snapshots in Natural Colors. Roll developed, 8 Natural Color Prints, only 25c. Reprints, 3c. Amazingly beautiful. Natural Color Photo, Janesville, Wisconsin.

FREE Sample. Send Negative. Streamline Studios, Box 5699-G8 Cleveland, O[illegible]

POULTRY

HEADQUARTERS -World Champion Layers. We Imported 353-361-364 egg Contest Hens from Australia-New Zealand. Free Educational Catalog shows Customers' Profits. Osborne Farm, Box 83, Holland, Michigan.

Fiber Guards Protect Worker's Shins



Consisting of fiber formed to the contour of the human leg, newly developed individual shin guards for industrial workers can be worn with absolute comfort either outside or inside apparel. A moulded sponge rubber pad is used between the inside of the guard and the wearer's clothing, acting as a shock absorbing device and adding to the worker's comfort.

MAKE Money With Poultry. Read America's leading poultry magazine for latest information. Three years $1.00; nine months 25c. Poultry Tribune, Dept. C 94, Mount Morris, Illinois.

POWER SCOOTERS & MIDGET CARS

MOTORS, tires, wheels, etc., for building scooters and midget cars. Low prices. Literature and power scooter plans 10c. Honsaker, Box 5680, Masontown, Pa.

PRINTING

PRINT your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit, $9.00; Senior outfits, $17.00 up. Details free. Kelsey Presses, B-57, Meriden, Conn.

125—8½x11 BOND Letterheads and 125 Envelopes, both printed, $1.00 prepaid. Benneville, 907 West Roosevelt, Philadelphia.

1,000 LETTERHEADS, Envelopes, Statements—$2.75 Delivered. Lackawanna Printers, Lackawanna, N. Y.

GOOD grade business cards $1.00 per 1,000. Goodall Company, 628 Montgomery Street, San Francisco.

RADIOS

PLANS 18 Tested Crystal Sets, SW record 4,250 miles, with "Radiobuilder"—year, 25c. Laboratories, 7700-K East 14th, Oakland, California.

SALESMEN WANTED

CITY and Rural Salesmen. Two for southern manufacturer rated at half million. Monthly earnings up to $400 to $800. Take orders for roof coating with the aid of numerous powerful, visual demonstrations. Used on warehouses, schools, garages, public buildings etc. Also full line of paints. Credit plan gives buyer long trial before paying a penny. Earnings advanced. Experience in our line not required but sales ability and intelligence absolutely necessary. We start you at our expense. Write immediately for complete details. The Zone Company, Box 4313, Dept. C, Fort Worth, Texas.

SALESMEN Sell Suits on our Easy Credit Plan. Free Suits and Pants given as bonus besides large cash profits, premiums and gifts. Sell only (5) suits to get a Free Suit. No limit to number of Free garments you may earn. Wholesale price $17.99 and up. Sample line Free. No experience needed to make easy sales. All garments individually cut and tailored to measure. Satisfaction or money back guarantee. Square Deal Tailoring Co., Inc., 316 W. Van Buren St., Dept. EP-1, Chicago, Ill.

THIS ad directed to salesman with sales ability. Application solicited for roof coating, paint, oil and grease proposition sold on long trial credit terms; no down payment. Earnings up to $400 to $800 per month. (Sworn statement.) Earnings advanced. No experience in our line needed, but intelligence and ambition Are needed. Otherwise, please do not waste your time or ours. Panther Oil & Grease Mfg. Co., Box 4306, Dept. 107, Fort Worth, Texas.

DON'T Be a Job Hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average $3,000 to $5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world-wide industry. Write Rawleigh's, Dept. C-U-MOM, Freeport, Ill.

IF YOU are ambitious you can make good money with a Rawleigh Route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box C-2-MOM, Freeport, Ill.

BIG Money Applying Initials on Automobiles. Easiest thing today. Free samples. Also, sideline salesmen for short order Decalcomania Name Plates. "Ralco," 1305 Washington, Boston, Mass.

ATLAS Window Sign letters. Large Sizes. Penny Each. Beautiful Free Samples. Atlas, 7941-G Halsted, Chicago.

BLADES. Finest quality. Factory prices, postpaid. Ace Blades, Buffalo, N. Y.

SPECTROSCOPES

SPECTROSCOPE quickest way to analyze chemicals, ores $2.50. Cudding Sons, Campbell, California.

TATTOOING SUPPLIES

TATTOOING—Engraving Outfits. Send [illegible] Plates. "Waters," M 965 Putnam, Detroit.

TELESCOPES, MICROSCOPES, ETC.

BUILD reflecting telescopes, 6" kit, $3.50: other kits—all abrasives, mirrors, eyepieces, diagonals, illustrated instructions, 10c; catalogue free. Optical Development Corporation, Dept. E, 1560 Broadway, N. Y.

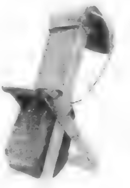
CHEMISTRY, Mineralogy, Microscopes, Telescopes, Binoculars. Catalog Free. Tracey Laboratories, Evanston, Illinois.

TELESCOPES, Microscopes, Binoculars; 1939 bargain catalog free. Brownscope Company, 5 West 27th Street, N. Y.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

TYPEWRITERS, Adder, Mimeograph, Multigraph, Addressograph. Send for Free lists of machines that will help you at half price. Pruitt, 27 Pruitt Bldg., Chicago.

Golfer's Chair-Bag



Invented by R. E. Moreland, of Galveston, Texas, the golf kit shown above is actually a combination golf bag and chair. The chair is a simple folding X-type to the back of which is attached a heavy canvas bag that holds a complete set of golf clubs. The chair has a canvas seat and is easily carried by means of a stout web belt which is placed conveniently over the shoulder.

VENTRILOQUISM

LEARN Ventriloquism by mail; small cost, 3c stamp brings particulars. Geo. W. Smith, 125 North Jefferson, Room S733, Peoria, Ill.

VIOLET RAY LAMP

ULTRA Violet—Infra Red. Dual Ray Health Lamp. Two separate Units in one. Promotes Sun Tan—Vitamin "D". Automatic control. AC DC current. $3.90 postpaid. Details. Bever Mfg. Co., 4515-M Cottage Grove, Chicago.

WELDING

ONE Dodge: Arc-welder, 25-125 amperes, 0-40 volts d.c. (Two Dodges: 25-200). Build your own from Northeast Dodge 12 volt generator without rewinding armature. Easy method. Guaranteed Instructive Plans $1.00. Welders Club of America, BB-3432 M-Mart, Chicago. Special: Dodge generators for sale.

ARC-WELDER, 25-600 amperes d.c., 0-75 volts. Build your own from d.c. vehicle motors. No rewinding. Guaranteed Instructive Plans $1.00. Welders Club of America, BB-3432 M-Mart, Chicago. For Sale: New and used d.c. Vehicle Motors.

DELCO Arc-welder, 25-200 amperes d.c., 0-75 volts. Build your own from 32 volt Delco light plant. No rewinding. Guaranteed Instructive Plans $1.00. Welders Club of America, BB-3432 M-Mart, Chicago.

44 "LESSONS in Arc-welding." Large one pound book. Domestic, 50c; Foreign, 75c. Welders Club of America, BB-3432 M-Mart, Chicago.

ARC-WELDING Outfit $1.25. Weld fenders, braze, solder. Lavrow, 5014 Tillman, Detroit.

WIND ELECTRIC PLANTS

BUILD wind light plant. Complete plans and valuable catalog 10c. Welders, Electric Fencers. LeJay Manufacturing, 414 LeJay Building, Minneapolis, Minnesota.

Scientific Experiments Prove Red Bait Is Best Fish Lure

When you prepare to go fishing get plenty of red on your bait.

Fish have a yen for red with green the second best liked color.

That is the finding of Dr. Frank A. Brown, Jr., assistant professor of zoology at Northwestern University after a long time of patient experimenting.

Dr. Brown put bass into large white enameled basins which were electrically wired. He fed them, using medicine droppers covered with adhesive tape tinted in various colors. Each fish had a certain color dropper, but if a dropper of another color was approached, the fish received an electric shock. Gradually each fish learned its particular training color.

"My experiment show that red is the most distinct color a bass sees, and green is second in this respect," he said. "Yellow is somewhat less distinct and blue appears almost identical with black."

The identications were that fish are able to distinguish among colors in about the same manner as would a human being with perfectly normal color vision looking through a yellowish filter.

So You're Buying A Boat!

[*Continued from page* 97]

will be better off to get a boat with a *marine* engine rather than a conversion. By this it is not meant that there is anything wrong with a properly converted automobile engine, but simply that the amateur who doesn't know motors will be safer and have less trouble with a power plant built expressly for marine use.

Before you lay the money on the line don't forget to see the sails. They should be stored indoors in a canvas bag. Spread them out on the floor and look 'em over. For a sloop they'd consist of mainsail, jib and spinnaker, although the latter is not essential. See that the reef points and battens are all there. If they look well cared for and not too old, they'll probably give you good service. A good suit of sails lasts for years of cruising, and unless you intend racing your boat you don't need to be too fussy about them.

There are always many minor adjustments needed in every boat, some of them merely a matter of the owner's taste or preference, but if the boat that's the apple of your eye passes all the tests in this article, she'll be a safe bet for you.

Soybean oil can be made in a variety of shades from almost white to a dark butter color.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

BRITISH Solomon Islands—Land of Cannibals and Head Hunters! Immense Solomon Islands Commemorative, $5. United States, Liberian Bongo Antelope, Mystery British Colony Triangle (a thrilling surprise!), fantastic Manchukuo Mausoleum, breathtaking beauty from Cayman Islands, etc. This astounding packet of bizarre and intriguing stamps absolutely free to approval applicants enclosing 3c postage. Viking Stamp Company, 1-R Hanson Place, Brooklyn, N. Y.

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc. This entire packet for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Company, Box 87-Z (G.P.O.), Brooklyn, N. Y.

1939 ANNUAL Free Features Canadians, Newfoundlands, United States, Colonials, Foreigns, Supplies. Sixty pages with Hundreds of Illustrations. Sent Free. Gray Stamp Company, MM., Toronto, Canada.

DESIRABLE Imperforate Miniature Sheet of Four Triangular Stamps (extremely limited issue) with 50 different World Collection, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

FREE -World's only Octagonal (eight-sided) set to approval applicants. Charles Cleaveland, 806 North Humphrey, Dept. X, Oak Park, Illinois.

UNITED STATES—45 Different, Perforation Gauge, Hinges, Bargain Price List—all for 10c. Seidenberg, Baroda, Mich.

PHILLIPINES 15 different including large pictorials 10c with approvals. Swedell, 3038 Harriet Ave., Minneapolis, Minn.

1,000 MIXED United States, 45c with low priced approvals. Gemstamp, Dale View Ave., Dayton, Ohio.

FREE!!! Two Coronation Sets. Postage 3c. Roberts, 312T Shearerbldg, Baycity, Michigan.

COINS

COINS, Beadwork, Indian Relics, Minerals, Old Glass, Books, Curios, Stamps. Catalogue, 5c. Indian Museum, Northbranch, Kansas.

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

COINS FOR SALE

COMMEMORATIVE Half Dollars, Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island. $1.50 each. Illustrated Catalogue No. 14, 25c. Norman Schultz, Salt Lake, Utah.

INDIAN CURIOS

INDIAN CURIOS. 100 good ancient Arrowheads $3.00. Tomahawk Head 50c. Illustrated catalog 5c. H. Daniel, Hot Springs, Arkansas.

OLD STAMPS WANTED

WILL pay $100.00 for 1924 1c green Franklin stamp, rotary perforated eleven $1,000.00 if unusued). Send 6c today for Large Illustrated Folder showing Amazing prices paid. Vernon Baker, 444-M1-3, Elyria, Ohio.

HEAVY BODY 3-IN-ONE KEEPS ELECTRIC MOTORS ON-THE-RUN!

RIGHT for electric refrigerators and washing machines, too! Gives electric tools longer life. LUBRICATES, CLEANS, PREVENTS RUST

At Hardware, Drug, Grocery, 10¢ Stores

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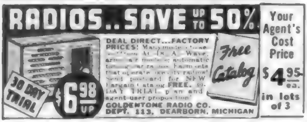
3 IN HEAVY BODY OIL
3-IN-ONE OIL

Government Jobs

Positions Clerk Carriers, Rural Carriers, Railway Postal Clerks, Postmasters, File Clerks, and many others. Splendid salaries, easy work, vacation with pay. Common school education sufficient. Examinations often. Established 1896. Send for our Civil Service Catalog No. 9.

Columbian Correspondence College Washington, D. C.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DEAL DIRECT...FACTORY PRICES! Many models [illegible] A-Wave, [illegible] automatic [illegible] that operate [illegible] radios! Send postcard for NEW Bargain Catalog FREE. 30-DAY TRIAL plan and agent-user proposition!

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Your Agent's Cost Price $4.95 ea. in lots of 3

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Trained Tool and Die Makers, precision machinists, automatic screw machine men earn as much as $50-$60 per week. Train at one of America's best equipped shops. Training work supervised by experts. Day-Evening classes. Low fee, employment help. Write NOW for free booklet "Practical Machine Shop Training."

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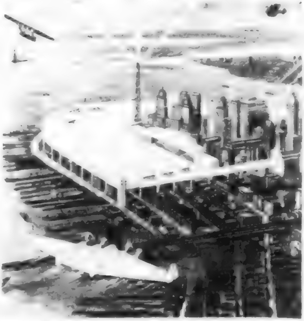
Dept. MI 3, 603-9 Lake St. Chicago, Ill.

MAKE MONEY AT HOME

RUBBER MOLDS Low as 6¢ EA.

A [illegible] rubber mold-making outfit makes perfect flexible molds for plaques, ash trays, book-ends, etc. Molds cost from 6c to 25c each. Each mold makes hundreds of novelties and gifts to sell up to $1.00 [illegible]! No experience necessary. Quick and easy. Start profitable business in your home . . . sell to stores, gift shops, friends, resorts, road stands, by mail. Full or spare time. "Molders Handy Book" and list of buyers FREE. Write SO-LO WORKS, Dept. R-834, Cincinnati Ohio.

"Skyport" Of The Future?



Visualizing the day when New York will be serviced by huge four-engined "flying wing" air transports (foreground) which will carry 100-200 passengers each between Europe and the U. S., an artist made the above sketch, showing what he believes the city's "skyport" of the future will look like. The landing area consists of concrete sheets mounted atop a steel girder-like framework, which is attached to the roofs of buildings. The tall buildings in the center of the "skyport" represent the city's famed financial section. Note the steamship docks and the Statue of Liberty in the harbor background.

New Telegraph Typewriters Aid Newspaper Reporters

Using a new, simple printing telegraph system, newspaper reporters at a news event can now sit at their own typewriters and send their stories directly back into their home city rooms.

Devised by W. G. H. Finch, expert on radio and wire facsimile, the new device utilizes ordinary telephone wires to carry the typed message and feeds its signals by electrical induction in to the wire without touching them.

Special merit claimed for the new method is that the cost of transmission is based only on the time the telephone line is actually used with the tolls comparable to an equivalent local or long distance telephone call.

A special typewriter keyboard is carried by the reporter to the assignment and he can operate from the nearest telephone. Mr. Finch, formerly assistant chief engineer of the Federal Communications Commission, has just received a patent covering the new system.

Bed Shelves For Lazy Readers

[*Continued from page* 74]

be finished after assembly. Some prefer to work the surfaces however, when they are more accessible.

Bend the goose neck in one end of the iron rod so that it will touch the head board at the same point on both the front and back sides. At a point below, that will allow space for the shelves, and still keep them well above the pillows, bend the rod into a small semi-eyelet as shown, and cut off. Heat the spots to be flattened in a blow torch, gas heater or furnace, and hammer flat. This can be done rather easily cold if you have a heavy hammer. Make holes through these flattened spots which will center on the back side of the shelves. Finally, fasten the two irons to the back of the shelves in line with the end spacers. Thus only the rubber covered portions of the rod will show. When the shelves are completed and hung in place, the only contact with the bed will be the upper and lower part of the bent rod which is rubber covered. The shelves themselves will rest about an inch in front of the wood. Yet they will be firm, will accommodate a number of things, including that book you are reading after retiring.

Experiments May Disclose New Hay Fever Treatment

Tiny quartz particles and oil droplets, covered with the protein of ragweed, are riding up and down in apparatus at the laboratory of Dr. Harold A. Abramson, of Columbia University and Mt. Sinai Hospital in New York, N. Y., to disclose new facts that may lead to improved methods of treating hay fever and to new methods of skin testing.

It is the surface properties of the protein in ragweed which are in part responsible for hay fever, Dr. Abramson said. The surface properties, in turn, are determined by the electrical charge on the surface.

Using a method basically similar to that which Prof. Robert A. Millikan employed in measuring the electrical charge on the electron—one of the all-time masterpieces of physical research—Dr. Abramson makes the protein-coated quartz and oil droplets ride up and down in an electric field. The speed of passage is a measure of the electrical surface properties of ragweed protein found in the pollen.

"On the basis of the electrical charge of ragweed, experiments on the application of the electrophoretic method, that is, electrical introduction instead of injection of ragweed into the skin, to hayfever therapy are in progress," Dr. Abramson declared.

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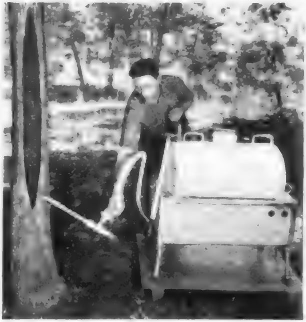
Steam Machine Helps Tree Surgeons Fill Cavities



Illustrated above is a newly perfected steam-pressure machine which is used by tree experts for filling cavities.

Plainly visible on the tree is the outer filling of the cavity, made of patented, interlocking rubber blocks. This weather-face is air-tight and steel-braced. Because of its rubber construction, it sways with tree movement and exerts a firm, "comfortable" pressure against the tender wood at the edge of the cavity, known as the cambium. New bark grows in healthy fashion over this rubber surface.

The machine is shown forcing melted, sterilized wax, by steam pressure, into the cavity back of the rubber dam, to fill all cracks and kill every lurking decay germ.

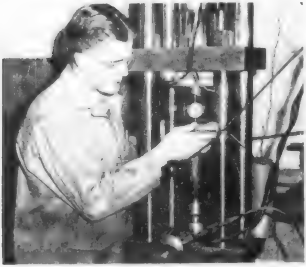
Every time a tree cavity is filled by this process, the tree is doubly protected, and the wound sealed against water and destructive growths which may lead to decay and re-infection.

Suggests Armored Plane-Car

A new aeronautical weapon, an armed and armored convertible airplane and automobile, was recently suggested by Waldo Waterman, designer of the "arrowbile," which is an airplane whose wings fold back for automobile use on the highways.

The armored "arrowbile," Mr. Waterman suggests, might land behind enemy lines in time of war and be driven under its own power to a point where its crew can make good use of the machine guns with which it would be equipped.

Machine Reproduces Forces Causing Earthquakes



Rocks flow, then break when subjected to the pressures found 30-50 miles inside the earth. This, David Griggs, Harvard scientist (above), found when he subjected rocks to such pressures with the apparatus above in the famous high pressure laboratory of Prof. P. W. Bridgman. The laboratory experiments have provided a new and useful clue as to why we have earthquakes, mountains and similar phenomena.

Study Provides New Data On Ultra-Short Radio Waves

The dream of using ultra-short radio waves as secret signalling means during wartime is receiving little encouragement from experiments undertaken at California Institute of Technology in Pasadena, Calif., indicating that such waves—believed at first to travel solely in line-of-sight fashion—really can bend around the surface of the earth.

Prof. G. W. Potapenko and Dr. Paul S. Epstein of the Institute have recently completed preliminary studies showing that waves of five meters and one meter length can be picked up at a distance of 18 miles at sea.

Marconi first noted such bending characteristics several years ago. At that time Dr. Epstein formulated a mathematical theory of the bending and, with aid from funds from Carnegie Institution of Washington, he and Prof. Potapenko have built the apparatus needed to carry out the studies.

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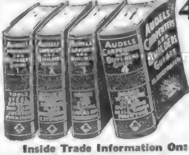

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New Ideas for Home & Shop

Names and addresses of manufacturers of products described below will be sent free to any reader on request, provided a stamped, return envelope accompanies the inquiry.

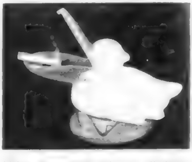
Specially designed for photography enthusiasts who live in apartments where space is limited, the cabinet shown above houses complete darkroom equipment including a sink, porcelain trays, shelf compartment and drawer for storing supplies.

A new, easily installed device for garage doors holds the doors open or closed, as desired, eliminating the marring of a car due to the doors slamming against it in a high wind as the car is entering or leaving the garage. Made of rust-proof metal.

Requiring no tanks or liquid generators, a new electroplating outfit features an electric brush with which the plating can be applied to objects as easily as painting.

A microscope substage light which can be used with any microscope, facilitating the examination of specimens.

A compact film slide viewer which enables photography enthusiasts to enjoy bright, sharp, enlarged views of their miniature film slides, black and white or color, without the bother of projection.



Using this pelican ash tray eliminates fires caused by forgotten cigarette stubs. Activated by a thermostatic device, Mr. Pelican swallows the lit stub when it has burned almost to the end.

A liquid preparation which, when applied to the inside of an automobile windshield, keeps the glass from fogging or steaming.

Unaffected by heat, cold or moisture, a new model cement is transparent and flexible and dries quickly.

Adaptable for autos, trucks, tractors and diesel engines, a new device removes solids from crankcase oil by filtration and gasoline dilution, water and corrosive acids through the use of exhaust heat, making frequent oil changes unnecessary.

A perfected automatic gas lighter which eliminates the need for matches when igniting gas ranges, heaters, etc.

A "putty" which can be applied to holes and cracks in old auto tires or other objects made of rubber, leather or cloth. Waterproof, flexible and skid-proof.

Equipped with a double ratchet mechanism for operation in both directions, the torque indicating wrench shown above has a calibrated dial which shows amount of pressure exerted.

As easy to carry as a cigarette case, this new vest pocket sport glass features a 3-power lens which is rectangular in shape so as to provide a wide view rather than a high one.

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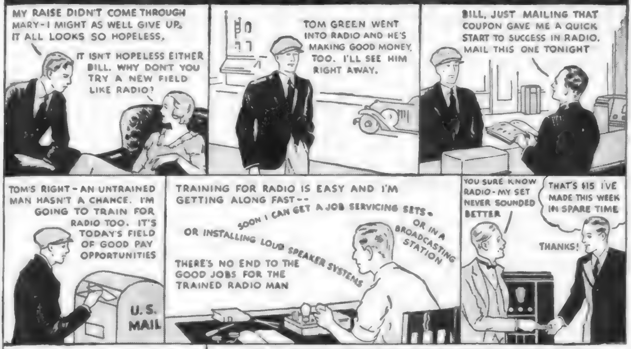
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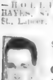

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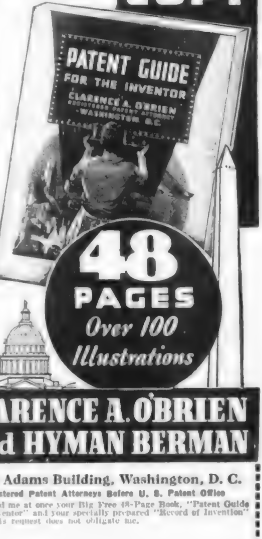

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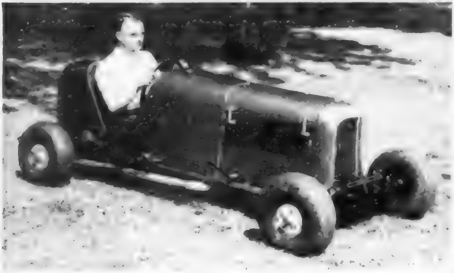
Chips from the Editor's Workbench

Send in photos of your completed workshop projects. Each month Mechanix Illustrated awards a first prize of $5 for the best photo and letter received by this department and prizes of $3 each for all other photos and letters used. Do not send negatives. Photos submitted will not be returned unless accompanied by return postage.



One of the best midget racers ever brought to the editor's attention, this car was built by W. C. Wagner, of Oneida, N. Y. A motorcycle engine and 3-speed transmission enables it to attain a top speed of 75 m.p.h. The wheelbase is 74 inches.

WINNING first prize of $5 in this month's Workbench contest, the photograph above was sent in by W. C. Wagner, of Oneida, N. Y., who has built the finest midget racer I have seen for quite some time. I am sure that every MI midget racer fan will agree that Wagner's car reveals craftsmanship of an A-1 grade.

The car has a wheel base of 74 inches, a tread of 44 inches and stands 30 inches high. The joints of the metal chassis are brazed, instead of bolted or riveted, assuring exceptionally sturdy construction. To facilitate getting in and out of the tiny cockpit, Wagner fitted the car with a small door, the hinges of which are concealed. The tires are of the type used on the tail wheels of huge Curtiss Condor airplanes.

Powered by a motorcycle engine and equipped with a 3-speed transmission, the midget car attains a speed of 75 m.p.h. and travels 40 miles on a gallon of gasoline. Wagner estimates that he spent about 1,000 hours constructing the car, but I think all Workbench readers will feel, as I do, that the time was very well spent. He is willing to sell plans for the car, so if you are interested I suggest you write to him at 437 Sayles Street.

* * *

Attending the annual Motor Boat Show held in New York City a short time ago, I was impressed by the evident growing interest in small boats. The publishers of MI feel that they have contributed greatly to this increasing interest, due to publication of an annual HOW TO BUILD 20 BOATS book, the latest edition of which is now on the newsstands or available from our Greenwich, Conn., office for fifty cents. Boats constructed from MI plans are scattered throughout the country. Hundreds more are under construction in home workshops at this very minute. Every one of these MI boats, built or being built, has inspired the construction or purchase of other boats. Can we be blamed for our pride in thus having boosted the sport of boating?

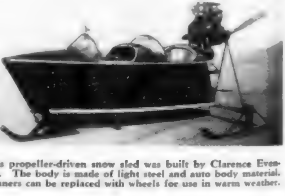
* * *

A $3 prize was awarded to Clarence Evenson, of Kindred, North Dakota, who sent in a photo of his propeller-driven snow sled. The sled features a light steel frame which is covered by metal auto body material. Capable of a speed of 50 m.p.h. it is powered by an old auto engine which whirls a 5-foot propeller. The runners can be replaced with wheels when the winter season is over. Nice work, Clarence.

* * *

Powered scooters continue to be a popular project with scores of workshop fans and one of the latest brought to my attention is that shown in the photo on page 12. Built by Arthur Drown, of Green Springs, Ohio, the scooter is powered by

[*Continued on page* 12]



This propeller-driven snow sled was built by Clarence Evenson. The body is made of light steel and auto body material. Runners can be replaced with wheels for use in warm weather.

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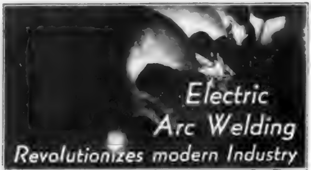

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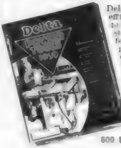

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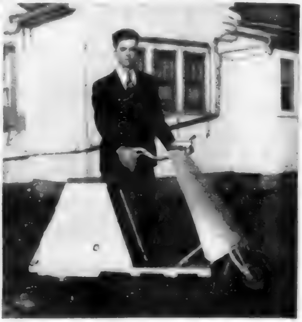
Editor's Workbench Chips

[*Continued from page* 10]



Ready for a jaunt over the highway, Arthur Drown poses with the powered scooter he built. It is powered by an old washing machine motor of the gasoline type and goes 20 m.p.h.

a washing machine motor of the gasoline type and he claims mileage of 100 miles per gallon and a top speed of 20 m.p.h. Airplane tubing was used for the frame work, being covered with sheet metal to form the body and front mudguard. Art has a sense of humor, calling the scooter "The Mule" because it has to be pushed to start. An MI check for $3 is on it's way to you, Art.

* * *

A photograph of the kyack he built from MI plans won a $3 prize for Lyell Vanatta, who neglected to provide his address. He says the kyack floats lightly with two passengers and handles easily when using either a single or double paddle. Send me your complete address when you read this item, Lyell, and a check will be sent to you immediately.

* * *

A practical method of mounting a gasoline type washing machine motor on a bicycle to power it is shown in the photo on page 14, which won a

[*Continued on page* 14]

MI plans helped Lyell Vanatta build this two-passenger kyack.

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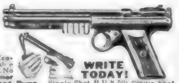
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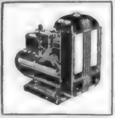

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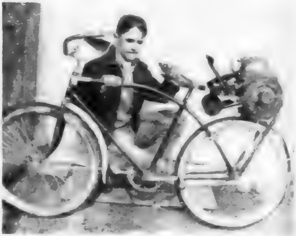


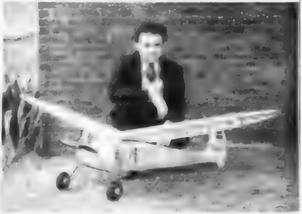
Every boy dreams of having a powered bicycle, but B. T. Smith made his dreams come true by fitting his bike with an old gasoline type washing machine motor. Friction drive is used.

$3 prize for B. T. Smith, of Tahoka, Texas. The motor is connected to a shaft by means of a V-belt which actuates a rubber-faced pulley that contacts the bicycle wheel through a hole cut in the top of the rear fender, thus making the friction contact that causes propulsion. The weight of the motor plus a small coil spring provides the necessary tension to keep the pulley from slipping. Well done, Smith.

* * *

Larry Eisinger, of New York, N. Y., scored a $3 prize by sending in the photo of his gas-powered model airplane. Featuring a wingspan of almost seven feet, the model is shown in an uncovered state, but he expects to complete it within a few days. Power is supplied by a miniature gasoline motor, the cylinder of which can be seen jutting upward through the nose. Happy landings, Larry.

[*Continued on page* 16]



Ready for covering, this model airplane was constructed by Larry Eisinger. Powered by a miniature gasoline engine of one-fifth horsepower, it has a wingspan of about 7 feet.

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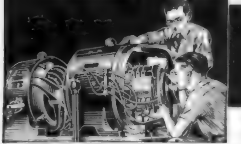
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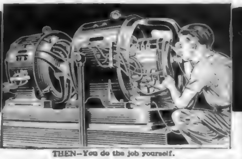
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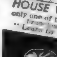
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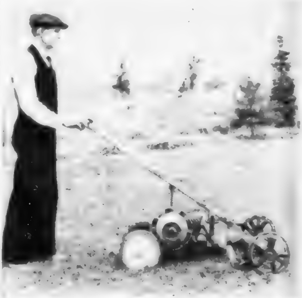


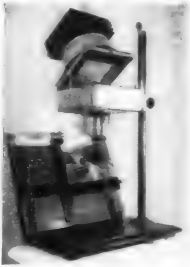
Adapting an old washing machine motor to a mower simplified the job of trimming his lawn for Charles Miller, of Kent, O.

The job of trimming his lawn will be a lot easier for Charles Miller, of Kent, Ohio, who fitted an old washing machine motor to his lawn mower, as shown above. A swivel connection beneath the point of attachment makes short turns easy, the motor being fitted with a set of wooden wheels. Bicycle chains and sprockets are used to slow down the high speed motor to satisfactory working limits. Very clever, Miller. I'm sending MI's check to Homer L. Jacobs, inasmuch as he sent in the photograph, but I assume he'll "split" with you.

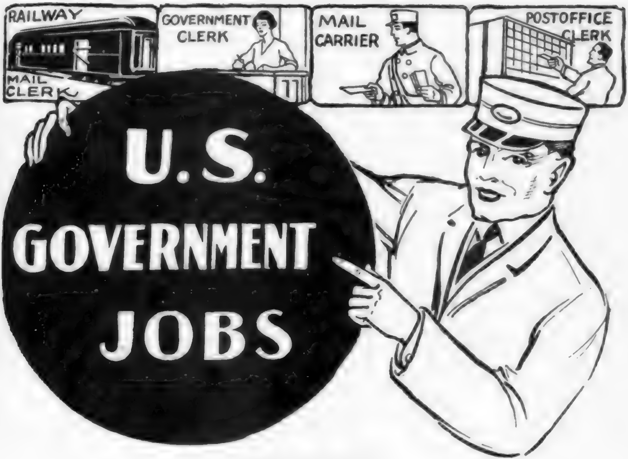
* * *

Photo fan Sidney Preen, of Perry, N. Y., was awarded a $3 prize for his photograph showing the enlarger he constructed from MI plans. He used a 6.3 lens taken from an old camera and reports very satisfactory results. Can't blame you for being so proud of your project, Sidney, for it looks like a well built job, as any photo "bug" will agree.

[*Continued on page 18*]



Fitted with a 6.3 lens, this MI enlarger produces excellent results, according to builder Sidney Preen.



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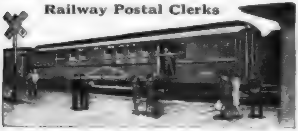

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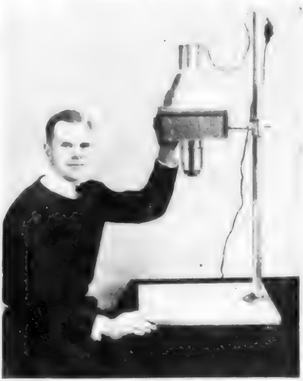

Harry Winters, Jr., an MI photography enthusiast, proudly poses with the enlarger be constructed.

Another photography enthusiast who was awarded a $3 prize is Harry Winters, Jr., of Bolton Landing, N. Y., shown proudly posing with the enlarger he built. MI plans were used and he claims it is the most practical enlarger he ever constructed. Thanks for the praise, Harry.

* * *

A photo of the midget car he built for his son Robert won a $3 prize for Howard Huntley, of Black River Falls, Wis. Powered by a motor of one-fifth horsepower, the home-built midget auto

[*Continued on page* 20]

What youngster wouldn't smile if his dad built him a midget car like this one. Robert Huntley is the proud driver and his dad built the car, which has a motor of only 1/5-horsepower.

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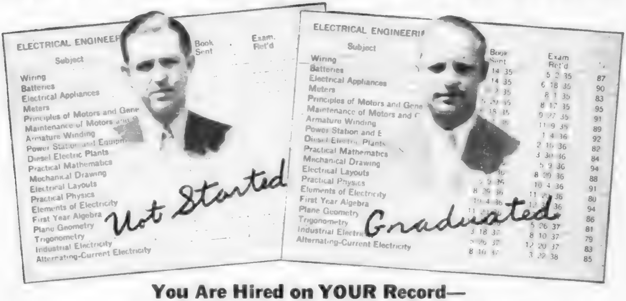
Which Man Would YOU Hire?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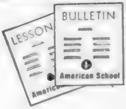
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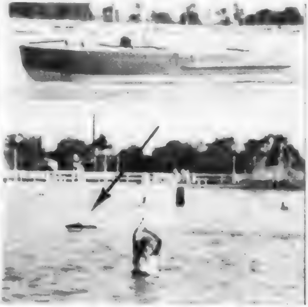


Top—Roscoe Judd built this model speedboat which is powered by an air-cooled gasoline engine of the type used in model airplanes. Lower photo shows how the boat (arrow) is confined to a circular course by means of a connecting cable held overhead by boy in water.

has a small tank that holds only one gallon of gasoline, yet this is enough for three hours riding. (Maybe you ought to carry an eye dropper full of gas as a "spare," Howard.) You forgot to state how fast the car runs, but my guess is that 10 m.p.h. is tops. How near to the mark am I, Howard?

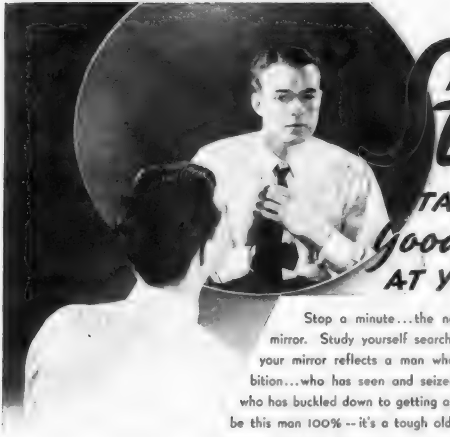
* * *

A hobby that is slowly, but surely, climbing to new heights of popularity is that of building and operating model speedboats. Speeds of 40 m.p.h. are claimed for some of the tiny water craft, so you can bet there are plenty of thrills in the average race. Shown above is a powered "water bug" built by Roscoe Judd, of Indianapolis, Ind., which is powered by an air-cooled miniature gasoline engine of one-fifth horsepower. He built the boat entirely from a drawing of a runabout designed by Gar Wood, the famous speedboat pilot and motorboat manufacturer, no plans being available. The lower photo shows how the model speedboat is confined to a circular course, being attached to a wire cable held overhead by the operator who stands in the water up to his armpits. I'm sending you a $3 check in the mail, Judd.

* * *

A well earned $3 award goes to Ralph Summers, of Lancaster, Pa., for the photo showing the powered scooter he constructed at a cost of about

[*Continued on page* 22]



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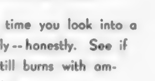

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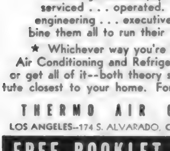

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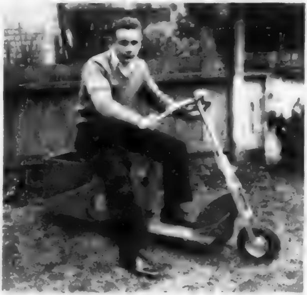
Editor's Workbench Chips

[*Continued from page* 20]



Featuring a compartment for carrying packages behind the seat, this scooter was built by Ralph Summers. A washing machine motor of ¾-horsepower provides a speed of 25 m.p.h.

$18. The frame is made of wood and wrought iron. A washing machine motor of ¾-horsepower provides a top speed of 25 m.p.h. The seat of the scooter features a compartment for the carrying of bundles. Looks like a professional job, Ralph. You are to be complimented on your craftsmanship.

* * *

Money earned by trimming lawns enabled Louis Blaisdell and a friend, of Whitestone, N. Y., to buy the materials used in building the dory shown in the photograph below. Costing $25.22, the dory required one year of spare time effort to complete and represents a first attempt at boat building. Judging from the photo, I'd say you have done VERY well, Louis. Watch for MI's check for $3 in the mail.

* * *

Some very pleasurable summer days are ahead for E. C. Sickel, of St. Paul, Minn., whose home-

[*Continued on page* 24]

Using money earned by trimming lawns Louis Blaisdell and a friend built this dory at a cost of $25.22. Isn't it a beauty?

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Editor's Workbench Chips

[*Continued from page 22*]

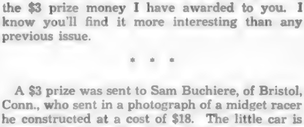
Happy summer days lie ahead for E. C. Sickel, who built this *Sunray* sailboat from plans that appeared in MI's boat book.

built SUNRAY sailboat is shown in the accompanying photograph. Built from MI boat book plans, the boat sails very well, according to Sickel, thus living up to the reputation set by other SUNRAY type boats and attesting to his skill in constructing it. If you are planning to build another boat, Sickel, be sure to get a copy of the 1939 HOW TO BUILD 20 BOATS book with fifty cents of the $3 prize money I have awarded to you. I know you'll find it more interesting than any previous issue.

* * *

A $3 prize was sent to Sam Buchiere, of Bristol, Conn., who sent in a photograph of a midget racer he constructed at a cost of $18. The little car is powered by a gasoline motor of two horsepower

[*Continued on page 26*]



Sam Buchiere constructed this midget runabout at a cost of only $18. A two-horsepower motor with chain drive is featured.

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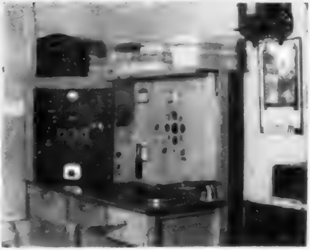
[*Continued from page 24*]



A real radio "ham" is Clarence Trost, operator of station W9HMZ, who built this "hobby desk." It features a radio transmitter, receiver, phonograph and drawers for supplies.

and eats up the road at 35 m.p.h., while giving mileage of 60 miles per gallon. A sliding clutch and chain drive are featured. I'll bet the car is a favorite with the local youngsters, Sam.

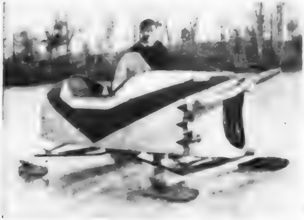
* * *

A novel project is shown in the photo sent in by Clarence Trost, of Concordia, Kansas, who is a radio "ham." (Call letters are W9HMZ.) It is a "hobby desk" which can be used as follows: (a) the bottom panel is an ordinary radio used for listening to regular broadcasts, the speaker being mounted on the back panel (b) the middle panel is used for playing phonograph records (c) the drawers are for the storage of model plane supplies, plans, etc. A radio transmitter is also built into the hobby desk. Very novel, Clarence, and well worthy of the $3 prize I'm sending you.

* * *

Frequently I receive requests from prospective boat builders for the names an addresses of MI reader-craftsmen in their localities who have already built rowboats, sailboats, etc. If you are willing to correspond with other readers relative to the boat (or boats) you have constructed, please send your complete name and address to me. Don't forget to mention the type of boat you built so that I can classify your letter for quick reference. Address your letter to: Workbench Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y. Who knows, if I get enough letters, the formation of an MI Boat Club may be the next step.

Editor's Workbench Chips



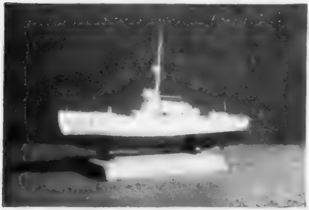
Carrying two persons, this aero-drive ice sled attains a speed of 60 m.p.h. Built by Richard Woods, it features an airplane-type dashboard and an automobile-type steering wheel.

A photo of the aero-drive ice sled he constructed won a $3 prize for Richard Woods, of Saugus, Mass. As can be seen from the photo, the sled has good lines and it is easy to believe Dick's claim that a speed of 60 m.p.h. is attained. The sled features an automobile-type steering wheel and an instrument dashboard that rivals that of any lightplane. Unfortunately, the photo of the dashboard which Dick sent along was too small to reproduce satisfactorily. Here's wishing you plenty of happy "zipp-zipps" over the ice, Dick, but watch out for holes.

•••

Remember the plans for the U. S. Coast Guard Patrol Boat model that appeared in the November, 1938 issue? Well, shown below is the 27½-inch model Stan Craig, of Youngstown, N. Y., constructed from the plans. Isn't it a beauty? Just the thing for decorating a den to give it a real nautical atmosphere. Accept my compli-

[*Continued on page* 29]



Measuring 27½ inches from bow to stern, this model U. S. Coast Guard Boat was made from MI plans by Stan Craig.

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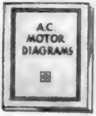

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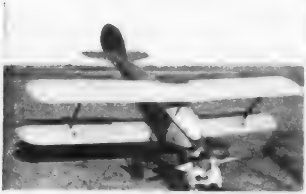
Editor's Workbench Chips

[*Continued from page 27*]



Tipped over on its nose to show details more clearly, this Lincoln Sportplane was constructed by Sgt. Albert Lessard, Air Corps, shown seated on ground. Swell job, sergeant!

ments for doing such a nice job, Stan; MI's check for $3 is on its way to you.

* * *

In the February issue, I ran a picture of Staff Sergeant Albert Lessard, of the Army Air Corps, riding the motor bike he constructed. Well, the sergeant has scored another Workbench prize of $3 by sending in a photo of the Lincoln Sportplane he built. After eight years service, during which it has had three different motors, the plane is still flying. The present power plant is a 50 h.p. Aeromarine motor. You certainly have proved that home-built planes can "stand the gaff," Lessard. I know I am echoing the thoughts of every amateur aviation fan in the country when I say "Well done!"

* * *

Speaking of amateur aviation, I have been informed that the states of Washington and Utah are considering legislation that would permit home-built planes to be flown within their borders. This is good news, if true. (I am checking the reports at this time.)

As many MI readers know, especially those who have followed the magazine since its early days, the state of Oregon has permitted home-built planes to be flown within its borders for the past 17 years and the amateur plane builders have set up an enviable record for design and safety (See MI, August, 1938.) For years MI published plans for building airplanes, ceasing only when regulations were enacted which made home-built planes illegal in the majority of states. However, in view of the interest readers have expressed in amateur aviation, arrangements have been made with the Private Flyers Association of Eugene, Oregon, to supply us with a few photos and descriptions of home-built planes each month and they will begin to appear in an early summer issue. Watch for these photographs and tell your friends to watch for them, too.

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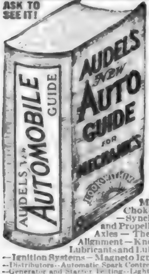
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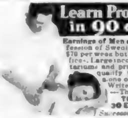

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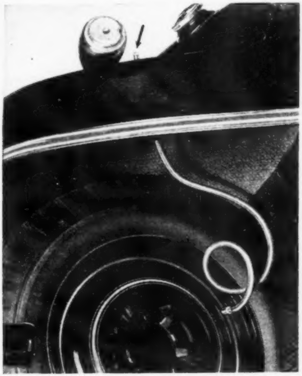


A newly developed device permits inflation of the spare tire of an auto without opening the rear compartment in which it is stored. As shown in the photo, the device consists of a length of rubber tubing leading from the tire valve to a valve connection installed outside the oompartment (arrow).

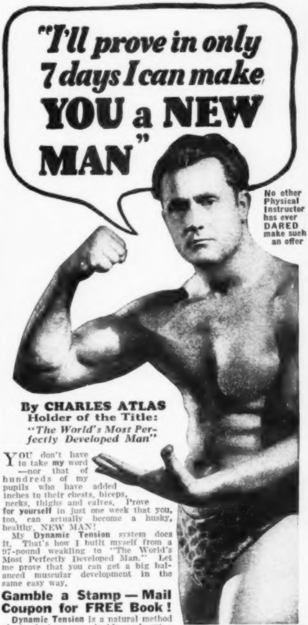
U. S. Bureau Announces New Non-Crystallizing Rosin

Development of a new non-crystallizing gum rosin has been announced by the Bureau of Chemistry and Soils of the U. S. Department of Agriculture.

The new gum, a natural rosin secured from pine gum, will not crystallize in ordinary usage, according to the Bureau. It is made by filtering the crude rosin for 24 to 48 hours through a muslin filter after standing long enough for crystallizable portions to separate from the main portions of the liquid. Pressure filtering is not possible because the crystals would liquefy.

Crystallization of rosin is a problem as it makes the use of rosin objectionable in some industries, such as the manufacture of adhesives, core oil, soap and paper size. Pilot plant scale tests show the process to be commercially feasible.

A human being's skin can stretch and contract 43 per cent.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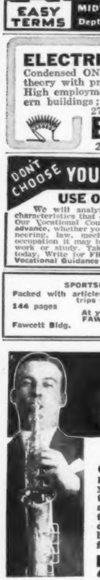

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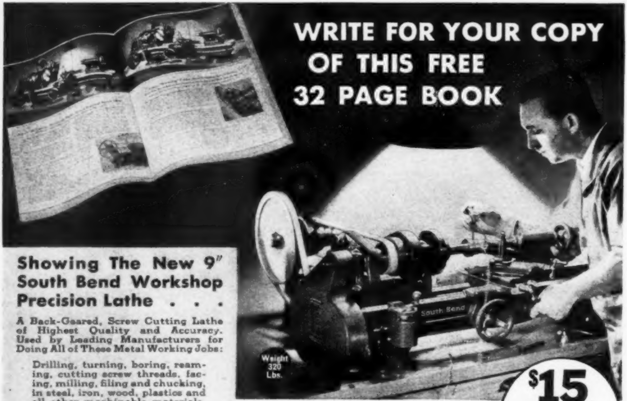

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